

**INTELLIGENCE MATERIEL DIVISION
TECHNICAL DATA HANDBOOK
No. 2**

COMBINATION LOCKS



SEPTEMBER 1997

PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

	<u>PARAGRAPH</u>	<u>PAGE</u>
PREFACE		v
SECTION 1: GROUP 1 & GROUP 1R COMBINATION LOCKS		
Sargent & Greenleaf Model 6600 Series	1—1	3
Sargent & Greenleaf Model 8400 Series	1—2	5
Sargent & Greenleaf Model 8500 Series	1—3	8
Mosler Model 300-400 and 301-401 MR	1—4	16
Mosler Model 302-402 MR and 302-402 MRK	1—5	16
LaGard Model 1980-ARL Combination Lock	1—6	20
Mas-Hamilton Group X-07 Electromechanical Lock	1—7	20
SECTION 2: OTHER COMBINATION LOCKS		
Other Combination Locks	2—1	29
Diebold Model 180 Series	2—2	30
Yale Model OC5 Series	2—3	32
Bode-Panzer	2—4	34
SECTION 3: COMBINATION PADLOCKS		
Sargent & Greenleaf Padlocks Overview	3—1	39
Sargent & Greenleaf Model 8065	3—2	41
Sargent & Greenleaf Model 8077 & 8077A	3—3	42
Sargent & Greenleaf Model 8077AB	3—3	42
Sargent & Greenleaf Model 8077AC	3—3	42
Sargent & Greenleaf Model 8088	3—4	44
SECTION 4: CHANGE KEYS		
Change Keys	4—1	51
SECTION 5: SECURITY MANAGER INFORMATION		
Purpose	5—1	55
Drill Resistant Hard Plate	5—2	55
Clear Plastic Dial Covers	5—3	55
Sargent & Greenleaf Model 8470 Modification	5—4	55
SECTION 6: PEDESTRIAN DOOR LOCKS		
Sargent & Greenleaf Model 8470 Combination Lock (SM50)	6—1	59
Mas-Hamilton CDX-07 Pedestrian Door Lock	6—2	60

PAGE INTENTIONALLY LEFT BLANK

PREFACE

General Services Administration (GSA) listed Group 1 and Group 1R Combination Locks are the only combination locks authorized for use on GSA Approved Security Containers throughout the US Government under Executive Order 12958, and Department of Defense Information Security Program Regulation (DOD ISPR) 5200.1-R, and the Department of the Army Regulation 380-5. A variety of Group 1 and Group 1R combination locks have been available for many years and continue to be used throughout the world. However, they have been deemed substandard and are being replaced by locks that meet the requirements of Federal Specification FF-L-2740-A. The intent of this consolidated Technical Data Handbook is to assist the individuals responsible for routine operations and combination changes. This handbook provides information concerning visual identification of locking mechanisms, component parts, proper methods of operation, procedures for changing combinations, and installation instructions on the latest combination locks on the market.

In order to expedite additions, changes and bulletins, and for ease of use as instructional material, a notebook format has been adopted for this handbook. This handbook, used in conjunction with Appendices F and G of AR 380-5, will assist Security Managers in reducing user errors and potential damage to security equipment.

Section 1 of this handbook describes those GSA listed Group 1 and Group 1R Combination Locks that may be used as replacement locks for original equipment on GSA approved Security Containers. The Mas-Hamilton Group X-07 Electromechanical Lock, included in Section 1, is currently the only approved lock for retrofit on GSA approved classified material storage containers. Section 2 provides detailed data on other locks which are found on non-GSA approved (substandard) steel filing cabinets in use until phased out (paragraph 5-102, AR 380-5). Section 3 provides data on GSA approved, three-position, changeable combination padlocks as defined in paragraph 5-101 and paragraph F-12 of Part II, Appendix F, AR 380-5. Section 4 provides data relative to appropriate change keys needed to change the combinations on all combination locks described in this handbook. Section 5 provides the Security Manager with ancillary security equipment available for use with combination locks.

In cases of difficulties encountered or questions regarding security equipment not covered in this handbook, the Intelligence Materiel Division (IMD), in accordance with paragraph 5-104.b.1, AR 380-5, will render technical assistance upon request. Requests should identify make and model of security equipment to be serviced as well as a full and complete description of the problem encountered. Requests should be addressed to: Chief, US Army Intelligence Materiel Division, ATTN: AMSEL-LC-IEW-I, 4554D Llewellyn Avenue, Fort George G. Meade, MD 20755-5315, telephone DSN 923-6716/3015 or Commercial (301)677-6716/3015.

PAGE INTENTIONALLY LEFT BLANK

SECTION 1: **GROUP 1 AND GROUP 1R** **COMBINATION LOCKS**

**SARGENT & GREENLEAF MODELS 6600 SERIES, 8400 SERIES, AND
8500 SERIES COMBINATION LOCKS**

**MOSLER MODELS 300-400, 301-401 MR, 302-402 MR AND
MRK COMBINATION LOCKS**

LAGARD MODEL 1980-ARL COMBINATION LOCK

MAS-HAMILTON GROUP X-07 ELECTROMECHANICAL LOCK

PAGE INTENTIONALLY LEFT BLANK

1-1. SARGENT AND GREENLEAF (S&G) 6600 SERIES COMBINATION LOCKS.

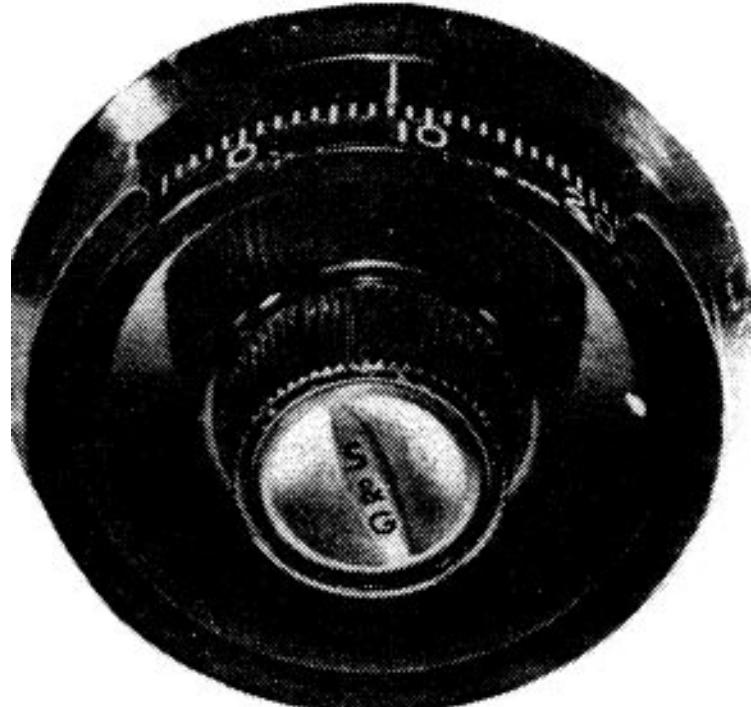
a. There are currently three versions of Sargent and Greenleaf (S&G) Combination Locks in use bearing the 6600 Series Model number. The first version was a hand changed lock introduced by S&G in the early 1950's. Although the lock depicted in Figure 1, has a spy-proof dial and dial ring, the majority of these locks are equipped with a front reading dial and dial ring. The second version of the S&G Model 6600 series, also a hand changed lock, was manufactured by S&G in the late 1960's for use on the Hillside Metal Products, now known as Art Metal, Class 6 Security Containers. This lock, as well as the earlier version, is no longer manufactured, nor are spare parts available from S&G. The third version using the S&G 6600 series designation was a key change lock (Figure 2), manufactured in the 1980 to 1981 time frame, and bears no resemblance to the previous versions. This lock was originally certified by Underwriter's Laboratories (UL) as a Group 1 or Group 1R depending on the material of the wheels. Subsequent tests of this lock by the Government revealed that this lock should not be considered a Group 1 combination lock. Further information and identifying data on this lock is located in Section 2. All data in this Section is only relevant to S&G 6600 Series 1950 and 1960 version locks.

b. To Unlock. Before operating the lock or changing the combination, read these instructions thoroughly. At the top of the dial ring an opening index mark is provided for normal dialing and opening (Figures 1 & 2). This is a precision lock, therefore, extreme care must be used to align the combination numbers with the index mark. Rotate the dial slowly and steadily. If, after rotating the



FIGURE 1

S&G Model 6600 Series (1950 version)

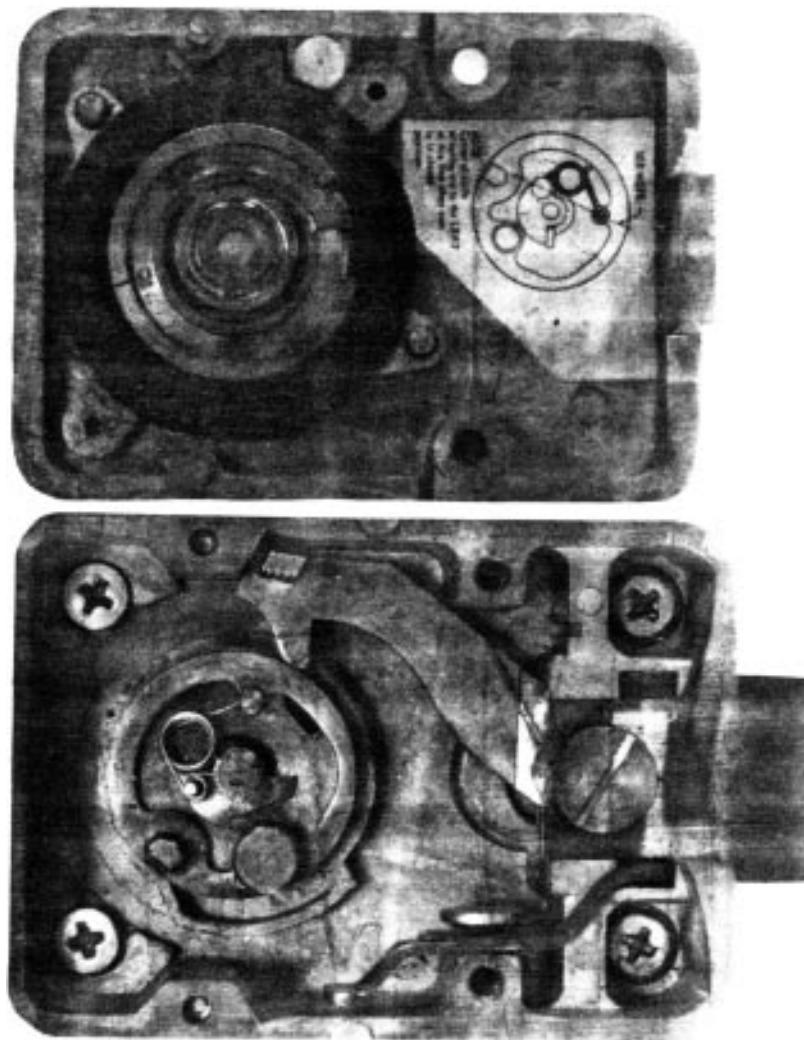


S&G Model 6600 Series (1960 version)

correct number of revolutions, any number is rotated beyond the index mark, the entire series of combination numbers must be redialed. DO NOT ROTATE BACK TO REGAIN A PROPER ALIGNMENT WITH THE NUMBERS. Each time a selected number is aligned with the index mark, a revolution is counted. CAUTION: Do not turn the Arrow Knob when dial is set at any position other than "0", because the internal spring will be bent, requiring the lock to be replaced. All locks in this series are set on 50-25-50 after final inspection at the factory. Rotate dial to "0" and make sure the arrow knob is pointing to "0", then:

- (1) Rotate dial to the LEFT, stopping when "50" is aligned with the index mark, the fourth time around.
- (2) Rotate dial to the RIGHT, stopping when "25" is aligned with the index mark, the third time around.
- (3) Rotate dial to the LEFT, stopping when "50" is aligned with the index mark, the second time around.
- (4) Rotate dial to the RIGHT, stopping when "0" is aligned with the index mark, the first time around.

FIGURE 2: S&G 6600 SERIES (1960 VERSION) DISASSEMBLED



(5) On the 1950's version, hold the dial with "0" aligned with the index mark, and turn the small arrow knob to the RIGHT as far as it will go. NOTE: On the 1960's version turn the arrow knob to the LEFT as far as it will go.

(6) Rotate the dial to the RIGHT until it stops. The bolt is now fully retracted and the safe or cabinet may be opened. The above procedure is used with any three number combination substituting the selected numbers for the example numbers 50-25-50.

c. To Lock. To lock, rotate the dial to the LEFT, stopping when "0" is aligned with the index mark. Hold the dial in alignment and turn the arrow knob as far as it will go opposite to the opening direction, then continue to rotate the dial to the LEFT for at least four complete revolutions.

d. Changing to a New Combination. Make up a new combination selecting three numbers of your own choosing. Do not use numbers between 0 and 20 for your last number (e.g., 46-82-13). For maximum security, do not use numbers ending in 0 or 5, and do not use numbers in a rising or falling sequence (e.g., 35-50-75 is not as good a combination as 54-38-72).

(1) Make sure lock is in locked position with dial set on 50 before removing lock cover.

(2) Remove two cover screws and lift cover from lock.

(3) Remove spirolox washer or retainer clip from wheel post and remove three wheels and two washers and lay out in order of removal (Figure 3). CAUTION: Wheels must be replaced in same order after changing.

(4) Take the last wheel removed with numbers facing you, and press up the inner disc separating it from the outer ring.

(5) Reset the inner disc in the outer ring with the index mark on the metal insert opposite the number selected for the first number of the new combination. Replace wheel on post with numbered side UP. Replace washer. CAUTION: Observe that numbers increase counterclockwise on wheels.

(6) Repeat the above process with the middle and top wheels. To help identify wheels, observe the middle wheel gate (cutout) is approximately 180 degrees opposite the number, 92.

(7) Replace the spirolox washer or retaining clip. Cover is now ready to replace on lock.

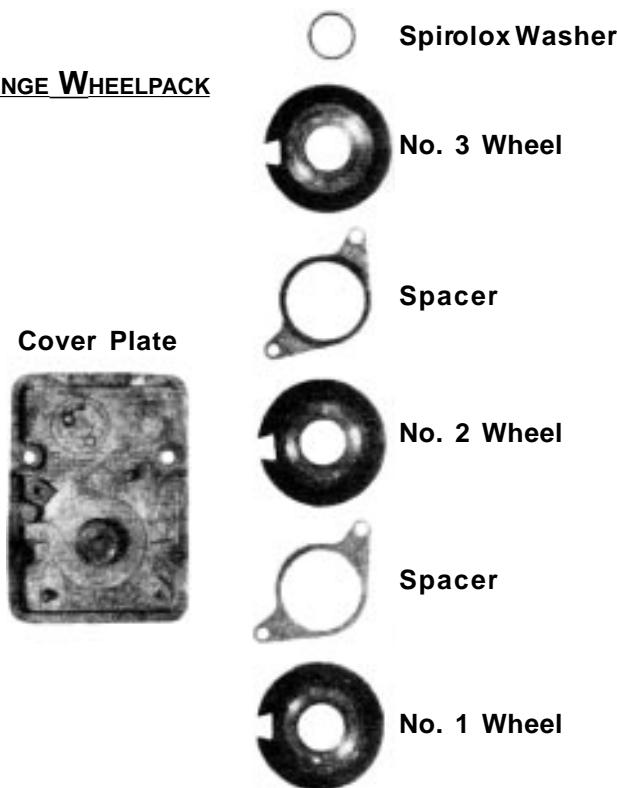
(8) Before closing the door, operate the new combination several times to test it.

1-2. S&G 8400 SERIES.

a. The 8400 Series S&G Combination Locks are key changeable Group 1 and 1R "Manipulation Proof" (MP) identified with the typical S&G arrow knob (butterfly) in the center of the dial knob.

b. To Unlock. Before operating the lock or changing the combination, read these instructions thoroughly. At the top of the dial ring an opening index mark (Figure 4) is provided for normal dialing and opening. This is a precision lock, therefore, extreme care must be used to align the combination numbers with the index mark. Rotate the dial slowly and steadily. After rotating the correct number of revolutions, should any number be rotated beyond the index mark, the entire series of combination numbers must be redialed. DO NOT ROTATE BACK TO REGAIN A PROPER ALIGNMENT WITH THE NUMBERS. Each time a selected number is aligned with the index mark a revolution is counted.

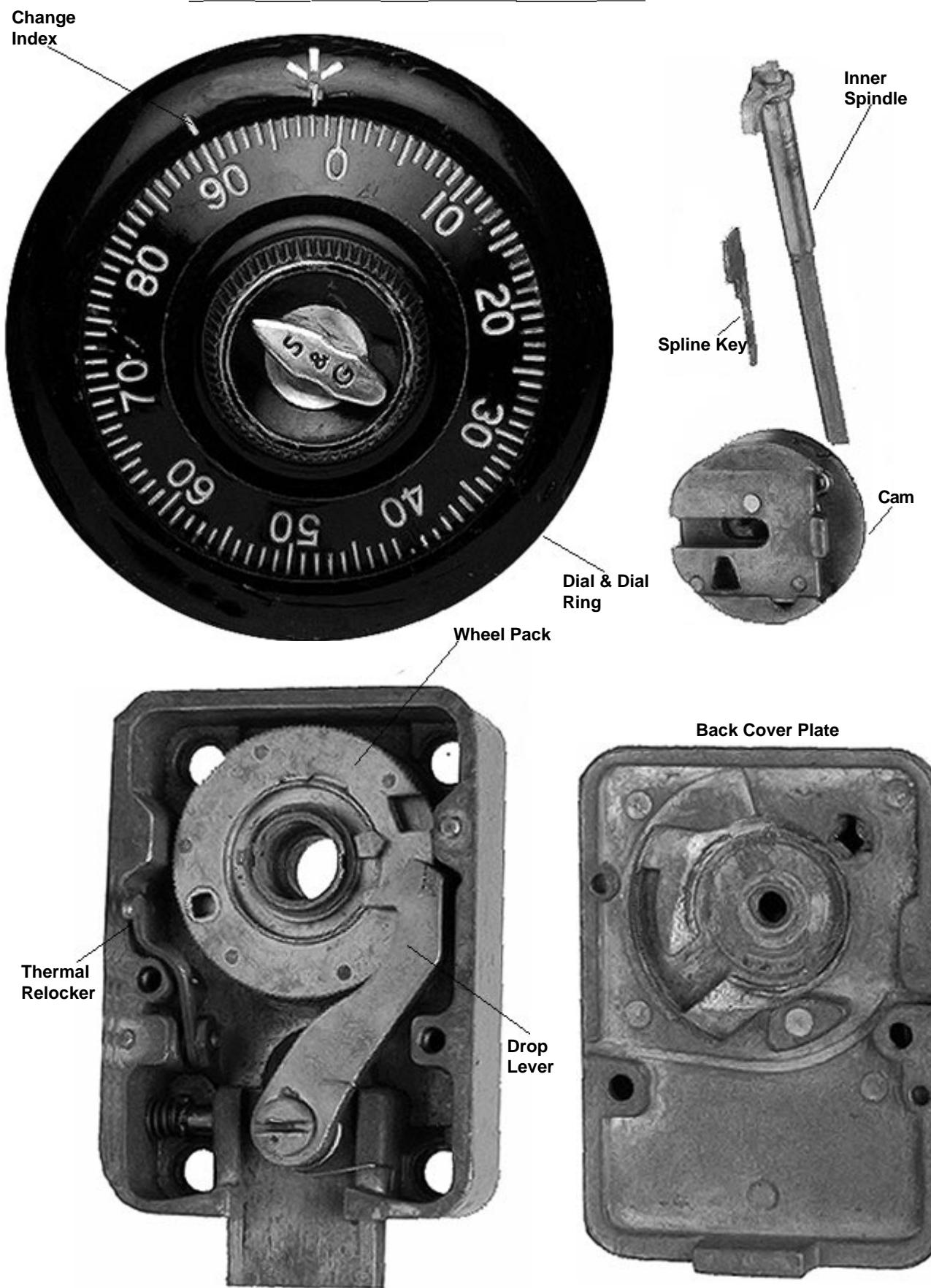
FIGURE 3: DISASSEMBLED HAND CHANGE WHEELPACK



CAUTION: Do not turn the arrow knob when dial is set at any position other than "0", because the internal spring will be bent, requiring the lock to be replaced. All locks in this series are set on 50-25-50 after final inspection at the factory. Rotate dial to "0" and make sure the arrow knob is pointing to "0" then:

- (1) Rotate dial to the LEFT, stopping when "50" is aligned with the opening index mark, the fourth time around.
- (2) Rotate dial to the RIGHT, stopping when "25" is aligned with the opening index mark, the third time around.
- (3) Rotate dial to the LEFT, stopping when "50" is aligned with the opening index mark, the second time around.
- (4) Rotate dial to the RIGHT, stopping when "0" is aligned with the opening index mark, the first time around.
- (5) Hold the dial with "0" aligned with the opening index mark, and turn the small arrow knob to the RIGHT as far as it will go.
- (6) Rotate the dial to the RIGHT until it stops. The bolt is now fully retracted and the safe or cabinet may be opened. The above procedure is used with any three number combination substituting the selected numbers for the example numbers 50-25-50.

FIGURE 4: SARGENT & GREENLEAF 8400 SERIES



c. To Lock. Rotate the dial to the LEFT, stopping when 0 is aligned with the index. Hold the dial in alignment and turn the arrow knob one quarter turn to the LEFT (as far it will go), then rotate the dial to the LEFT for at least four complete revolutions.

d. Changing to a New Combination. Make up a combination, selecting three new numbers of your own choosing. Do not use numbers between 0 and 20 for your last number (e.g., 46-82-13). For maximum security, do not use numbers ending in 0 or 5 and do not use numbers in a rising or falling sequence; e.g., 35-50-75 is not as good a combination as 54-38-72. CAUTION: Use Change Key 6720 (unless otherwise specified on back of lock, Figure 4) on this Series lock, other keys will not function properly.

(1) Using the changing index, dial the existing combination as previously explained.

(2) Hold the dial with the last number at the changing index found 8 1/5 numbers to the left of the opening index. Insert the change key in the key hole in the back of the lock until the wing is entirely inside the lock and comes to a positive stop.

(3) Turn key one quarter turn to the LEFT. With the change key in this position, turn the dial four complete turns to the LEFT, stopping when the first number of the newly selected combination aligns with the changing index, the fourth time.

(4) Rotate dial to the RIGHT, stopping when the second number is aligned with the changing index, the third time.

(5) Rotate the dial to the LEFT, stopping when the third number is aligned with the changing index, the second time.

(6) Holding the dial in this position, turn the change key back to the RIGHT and remove it. The new combination you have selected is now set in the lock.

(7) Before closing the cabinet, try the new combination several times, using the opening index.

WARNING: Never insert the change key in the lock when the cover is removed. Always be certain that the wing of the change key is entirely within the lock (as illustrated) before turning key.

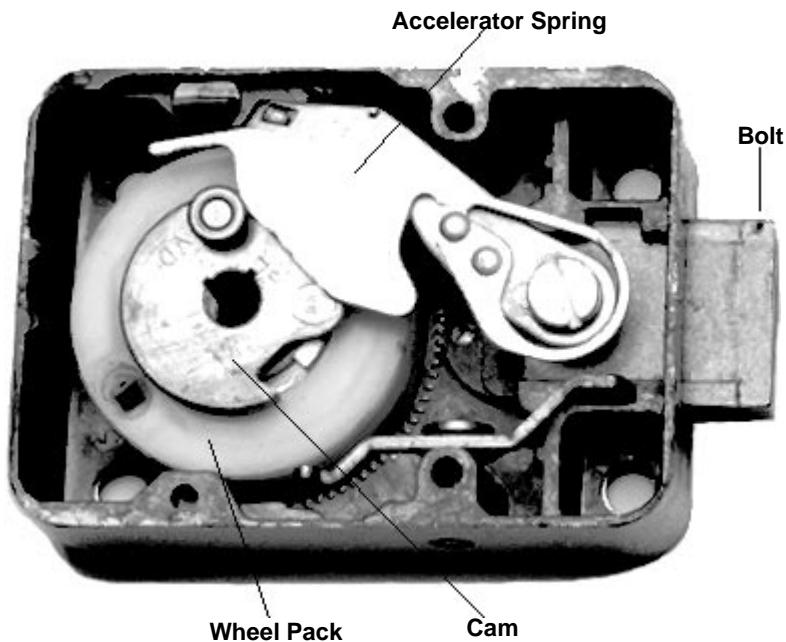
e. If an error has been made in setting a new combination, we suggest that local Facilities Engineers or supporting Military Intelligence (MI) personnel be notified. We urge that a new temporary storage facility be found until competent assistance arrives. DO NOT shut control drawer or vault door when this error occurs.

1-3. S&G 8500 SERIES COMBINATION LOCKS.

a. There are several methods of attack to penetrate combination locks. Manipulation Proof (MP) locks produced by Sargent and Greenleaf offer far greater protection than any other lock. The 8500 Series MP locks have been designed to give added protection against penetration in light of new scientific instruments and methods of attack. The security offered conforms to UL Groups 1 and 1R. This Series does not have the typical inner spindle thumb turn knob (arrow knob or butterfly) on the dial as used in previous S&G Group 1 and 1R MP combination locks. The 8500 Series may be identified by a plain center dial that can be pushed in at the zero location. This action is spring loaded and causes a definite

FIGURE 5: S&G 8550 SERIES

click to be triggered. Reading this information is important to appreciate the 8500 Series MP locks' features which must be properly understood by installation and service personnel. In order to make a satisfactory installation, it is necessary for these instructions to be followed closely. **IMPORTANT:** Tolerances must be maintained and related components must be used to achieve overall satisfactory performance. The lock is designed for right-hand, vertical-up or vertical-down use. Left hand operation was originally achieved with a true left-hand model. A Universal Model has superseded these, and is

FIGURE 6: S&G 8500 SERIES

the present model offered. All models feature a relock trigger as a standard security feature. The 8500 Series Combination Lock is available in four models. They are:

8550: Three brass wheels, no tube

For: Universal order 8550-UNI (Present Model)

For: Right Hand Vertical Up or Vertical Down order 8550-COM Obsolete (ref. only)

For: Left Hand order 8550-OLM Obsolete (ref only)

8555: Three brass wheels, with tube

For: Universal order 8555-UNI (Present Model)

For: Right Hand Vertical Up or Vertical Down order 8555-COM Obsolete (ref only)

For: Left Hand order 8555-OLM Obsolete (ref only)

8560: Three X-ray Proof Wheels, no tube

For: Universal order 8560-UNI (Present Model)

For: Right Hand Vertical Up or Vertical Down order 8560-COM Obsolete (ref only)

For: Left Hand order 8560-OLM Obsolete (ref only)

8565: Three X-ray Proof Wheels, with tube

For: Universal order 8565-UNI (Present Model)

For: Right Hand Vertical Up or Vertical Down order 8565-COM Obsolete (ref only)

For: Left Hand order 8565-OLM Obsolete (ref only)

b. Dialing Combination to Unlock. Before operating the lock or changing the combination, read these instructions thoroughly. On the dial ring, there are two indices. The index at the top is for normal dialing and opening. The index to the left is provided for use only when changing the combination. Rotate the dial slowly and steadily. After turning the correct number of revolutions, should any number be turned beyond the index mark, the entire series of combination numbers must be redialed. Do not turn back to regain proper alignment with the numbers. Each time a selected number is aligned with the opening index a revolution is counted. To unlock on a factory setting (50-25-50):

(1) Rotate the dial to the LEFT, stopping when "50" is aligned on the opening index the fourth time around.

(2) Rotate the dial to the RIGHT, stopping when "25" is aligned the third time around.

(3) Rotate the dial to the LEFT, stopping when "50" is aligned the second time around.

(4) Rotate the dial to the RIGHT, stopping when "0" is aligned the first time around.

(5) With "0" aligned in the index, push dial in to activate lever assembly, release dial.

(6) Rotate the dial to the RIGHT for a right hand and Universal lock and LEFT for a true left hand lock, until the bolt is fully retracted. Then the combination lock can be opened. NOTE: True left hand locks are no longer made, but early 8470 dead locks used these for left opening doors.

This procedure is used with any three number combination selected. CAUTION: Dial should not be pushed in and released at "0" until all three numbers have been dialed.

c. To Lock. Rotate the dial LEFT or RIGHT at least five complete revolutions in one direction.

d. Changing to a New Combination. Make up a new combination selecting three numbers of your own choice. Do not use numbers between 90 and 10 for your last number.

NOTE: Use Change Key 6720 (see Figure 23, Section 4) only on these locks. Other keys will not function properly. Use this figure as a guide when identifying and selecting your change key. When using new locks and new change keys, the change key may be difficult to turn at first. This situation may be eliminated by removing the lock cover, inserting the change key through the hole in the cover and turning it several times. Then remove the key and replace the cover on the lock. **WARNING!!!!** Never insert the change key into the lock itself when the cover is removed. Also, always be certain the change key is entirely within the lock before turning.

(1) Using the changing index (Figure 5), dial the existing combination as explained previously (paragraph 1-3b(1) through (3)) substituting changing index.

(2) Leave the dial with the third number at the changing index, insert the change key in the key hole in the back of the lock until the wing is entirely inside the lock and stops.

(3) Turn key one quarter turn counterclockwise. With the change key in this position, dial your newly selected combination to the change index.

(4) When the third number is aligned with the changing index the second time, hold the dial in the position, turn the change key one quarter turn clockwise, which will relock wheels with the new combination set.

(5) Before closing the container, try the new combination several times using the opening index, as per paragraph 1-3b(1) through (6).

NOTE: Read complete instructions on each style of lock before installation.

e. General Installation Instructions for S&G 8500 Universal (UNI) Series Locks to be followed when replacing locks in security containers.

(1) Remove the lock cover. Put the lock bolt in the extended position and the accelerator spring in the loaded position. (Figure 6) **CAUTION: DO NOT** remove the drive cam.

(2) Mount the lock in place with four 1/4 x 20 attaching screws (provided).

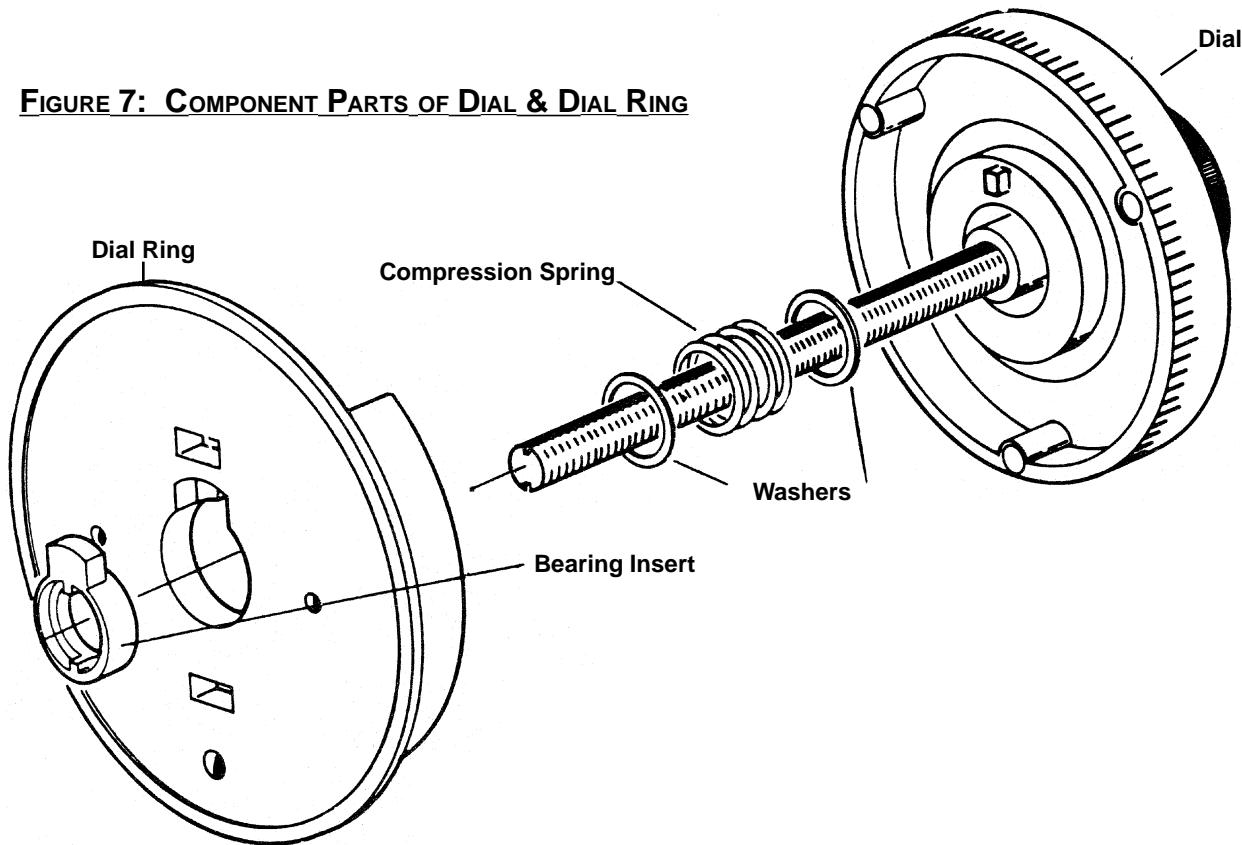
(3) Attach the dial ring, lightly tighten the attaching screws to hold the dial ring in place for alignment. Dial ring opening index should be at 12 o'clock center position. Before installation of the dial ring, the plastic bearing insert (Figure 7) should be pressed into the opening in the back of the dial ring. The insert must fit flush with the dial ring.

(4) To install dial, hold the drive cam in place with one hand and thread the dial into the cam until the dial comes to a stop against the surface of the dial ring.

(5) The alignment of the dial and dial ring is critical to the operation of the lock. Perfect alignment must be obtained. The dial should be flush and centered with the surface of the dial ring, for true center (Figure 8).

(6) Measure the excess spindle that projects beyond the drive cam.

FIGURE 7: COMPONENT PARTS OF DIAL & DIAL RING



(7) Remove the dial, cut off excess spindle and remove burrs.

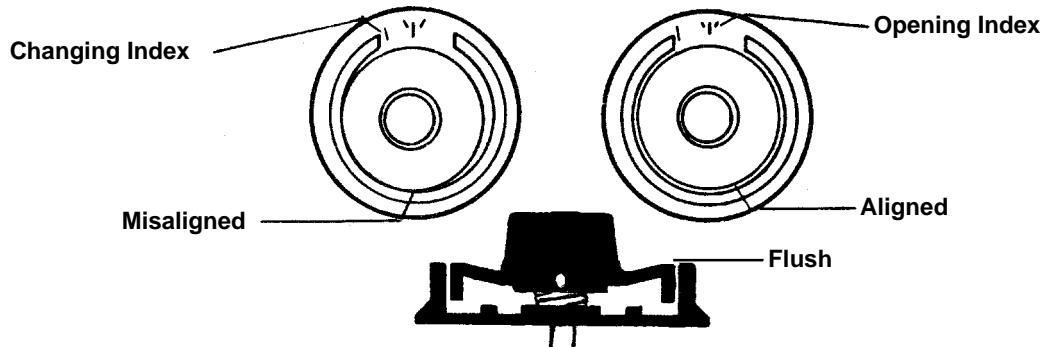
(8) Tighten the dial ring screws.

(9) Place a washer, compression spring and washer on hub of dial.

(10) Insert the dial into the lock. Holding the drive cam in place (to receive the nose of the drop lever) with one hand, thread the dial into the cam until the dial stops.

(11) Rotate the dial counterclockwise a MINIMUM of one full turn until the spline in the spindle is aligned with the proper spline in the cam, the cam is positioned to receive the nose of the drop lever, and the dial is on zero. NOTE: If the lock is mounted in the vertical-up or vertical-down

FIGURE 8: ALIGNMENT OF DIAL TO DIAL RING



position the properly aligned spline should be marked VU/VD on the drive cam. For right or left hand mounting RH/LH should be aligned.

(12) Insert the spline key with lip toward edge of cam. Tap in lightly. The dial must turn freely with no rubbing or interference. (NOTE: Before attaching cover to lock, check for proper in and out travel of dial for operation of accelerator spring.)

(13) Rotate the dial at least one complete revolution and stop at "0". The accelerator spring should now be in the loaded position.

(14) Hold the cover in place on the lock and push the dial in at "0". Release the dial. Remove the cover and check the position of the accelerator spring (spring should be in the released position). If the accelerator spring is not in the released position, the dial has not been backed out of the cam far enough. This condition must be corrected.

(a) Repeat step (11).

(b) Rotate the dial at least one complete revolution and stop at "50". The accelerator spring should not release. (If the accelerator spring does release, the spindle must be turned clockwise into the cam one revolution and this step repeated.)

(c) Hold the back cover in place on the lock and push the dial in at "50". The accelerator spring should not release. (If the accelerator spring does release, the spindle must be turned clockwise into the cam one revolution and this step repeated.)

(15) Dial the set combination (50-25-50) on the lock and observe the drop lever falling into the drive cam at least three times.

(16) When the accelerator spring is opening properly, the cover may be attached to the lock and the new combination set.

f. Special Instructions for S&G 8500 Series Tube Locks.

(1) Fasten the lock to the mounting plate. Place the dial ring on the tube.

(2) Measure the tube excess. Remove the lock and cut off excess. Leave 3/16 inch to insert in dial ring.

(3) Remove any burrs from end of tube. Replace the dial and ring on the door and proceed with the instructions in paragraph 13.e.

g. Torque Adjustment. The torque adjustment feature allows the feel of the dialing of the combination to be adjusted for individual preference. With cover removed, insert Allen wrench into adjusting screw. Turn clockwise to tighten or counterclockwise to loosen. NOTE: Adjustment should not be less than 18 inch-ounces of dialing torque, i.e., slight drag on the dial.

h. Disassembly for Servicing. Periodic servicing will extend the life of the lock and is essential for maintaining proper security. To do a proper servicing job, follow the disassembly carefully (see Diagram of Disassembled Lock, Figure 9).

(1) Remove lock cover.

(2) Remove lever screw and lever assembly. Be sure to remove the lever control tension spring so you will not misplace it.

(3) Using a pair of side cutters, grip the head of the spline key as close as possible to the surface of the drive cam. Lift straight up being careful not to bend the head. The edge of the case may be used for leverage.

(4) Unscrew the dial from the lock. Remove cam.

(5) Remove Spirolox washer from wheel pack carefully with a sharply pointed instrument.

(6) Remove wheels and associated parts and place them in sequence so that they can be replaced in proper order.

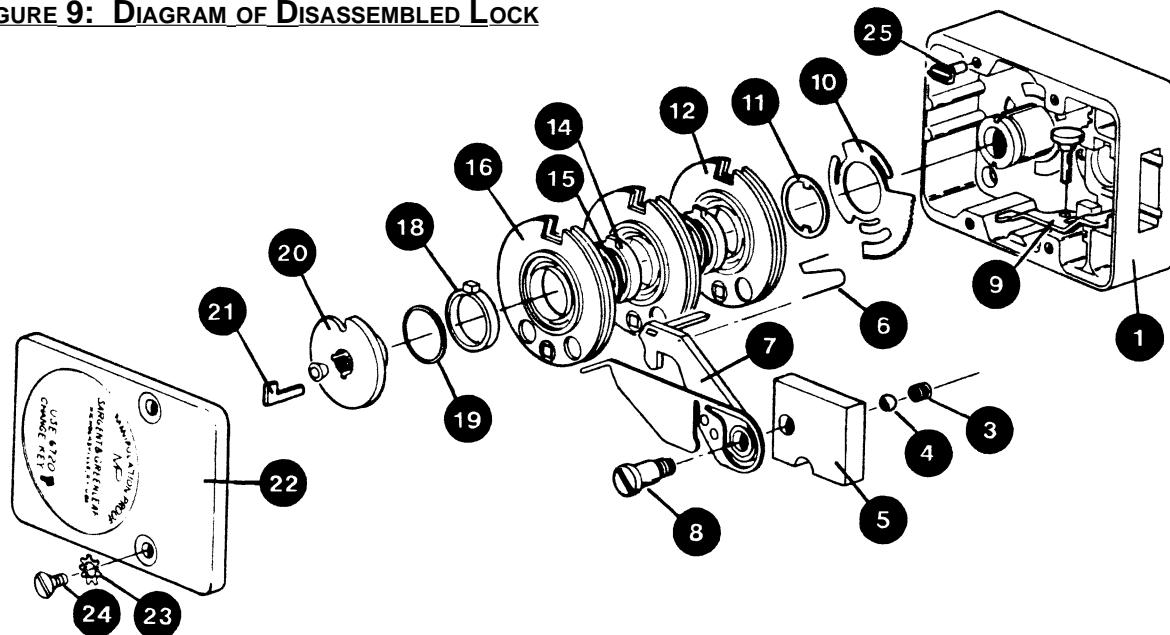
(7) Remove the lock bolt, do not misplace the detent ball or ball spring.

(8) Remove dial and spindle assembly from dial ring.

CAUTION: Remove the washers and spring from the dial ring and carefully place them in sequential order for reassembling later. The lock is completely disassembled and ready for servicing.

i. Service and Reassembly (Figure 9).

FIGURE 9: DIAGRAM OF DISASSEMBLED LOCK



1. Case, non-tube models	11. Spacing Washer	21. Spline Key
2. Case, tube models	12. Bottom Wheel, Brass	22. Cover
3. Detent Spring	13. Bottom Wheel, Delrin	23. Cover Washer
4. Ball Detent	14. Middle or Bottom Fly	24. Cover Screw
5. Bolt	15. Spacing Washer	25. Spring Hook Stud
6. Lever Spring	16. Middle/Top Wheel, Brass	26. Wheel Pack(Brass) includes
7. Lever Assembly	17. Middle/Top Wheel, Delrin	items 11, 12, 14, 15, 16, 18 & 19
8. Lever Screw	18. Top Fly	27. Wheel Pack (Delrin) includes
9. Relock Lever	19. Retaining Ring	items 11, 13, 14, 15, 17, 18 & 19
10. Tension Spring	20. Drive Cam	

(1) Tighten the attaching screws on the dial ring and lock.

(2) Wipe each wheel, the wheel post and other bearing surfaces clean. Wipe complete interior of the lock case clean.

NOTE: S&G recommends GE-322L Lubricant be used. If this lubricant is not available, we suggest using a thin film of white petroleum jelly.

(3) Lightly grease the bolt holding up the relock device and insert the bolt.

(4) Be sure to examine each wheel part, the cam and lever assembly carefully to make sure nothing is worn or damaged. Replace the wheels and parts exactly as they were before disassembly.

(5) Lightly grease the bearing surfaces of wheel post and drive cam bearing, then screw the dial and drive cam together until snug. Hold the cam and turn the dial back one complete turn, then align the spline keyway. Insert the spline key. **IMPORTANT:** It is recommended that a new spline key be used each time the lock is serviced.

(6) Grease the lever bushing and install the lever. Tighten the lever screw snugly and carefully position the lever control tension spring. Be careful not to bend the actuator spring.

(7) Install the lock cover. Make sure the cover screws are tight and secure.

(8) Reset the combination.

(9) Check the combination at least three times before locking the safe.

j. Errors. The most frequently made error during the changing procedure is dialing the number on the wrong index. Occasionally, all the numbers may be dialed to the opening index rather than the changing index. More often, dialing part of the combination to the changing index and part to the opening index occurs. As long as the container or door is open, the error is easily corrected.

k. Recovery Procedure in the Event of Error.

(1) Remove the back cover of the lock.

(2) Insert a straightened paper clip or similar instrument in the square keyways in the wheels.

(3) Rotate each wheel until all keyways are in perfect alignment directly over the small hole in the bottom of the case. There are two holes in the case, the keyway in the cover generally tells you the correct location.

(4) Replace the cover and screws then insert the change key. **NEVER INSERT THE CHANGE KEY INTO THE LOCK WHEN THE COVER IS REMOVED.** Always be certain the wing of the change key is entirely within the lock before turning the key.

(5) Turn the change key one quarter turn and dial the new combination using the changing index.

(6) Remove key with the combination now set.

(7) Try the combination at the opening index at least three times before closing the door.

1-4. MOSLER 300-400 AND 301-401 MR SERIES LOCKS. There are four models of the Mosler Combination Lock. Although the detailed instructions in this handbook deal only with the 302-402 MR and MRK series Mosler locks, the following series of locks might also be encountered in the field:

a. The Mosler Model 300-400 hand change combination lock is the forerunner of the Manipulation Resistant (MR) series Mosler currently manufactures. The wheel pack used in this lock is constructed of a light gray plastic material, which includes the inner disc which is used to set the combination. This lock was usually supplied with a bright chrome dial and dial ring.

b. The Mosler Model 301-401 MR is also a hand change lock and was usually supplied with a bright chrome dial and dial ring. The wheel pack consisted of the same light gray plastic material as the Mosler Model 300-400. The inner disc of each wheel is constructed of metal.

1-5. MOSLER MODELS 302-402 MR AND 302-402 MRK. The Mosler Model 302-402 MR (Figure 10) is the current model of the Mosler Hand Change Combination Lock. This lock can be identified

FIGURE 10: MOSLER 302 MR HAND CHANGE LOCK

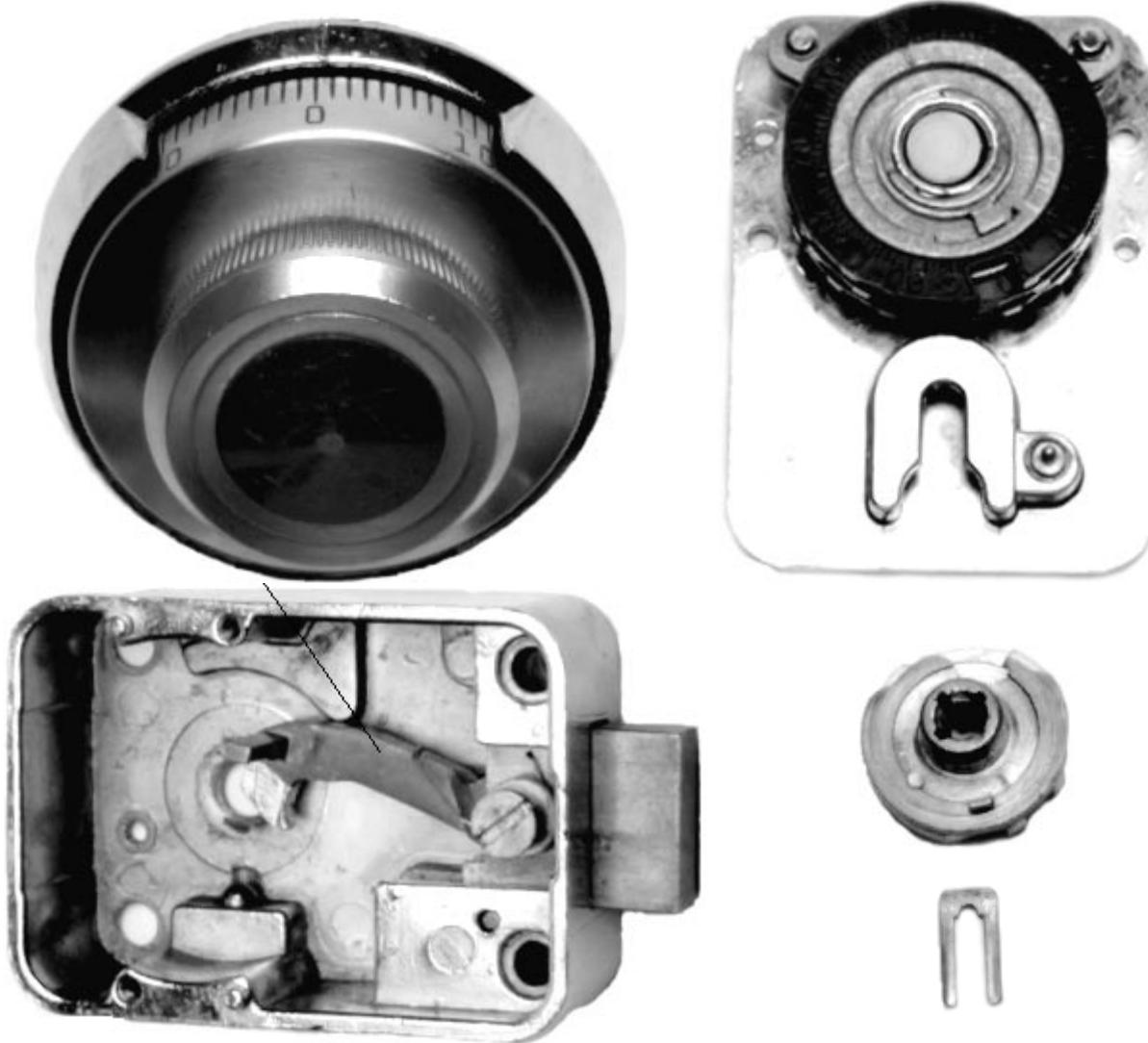




FIGURE 11: MOSLER 302 MRK KEY CHANGE LOCK

from the exterior by a brushed chrome dial and dial ring. The wheel pack is constructed of a black plastic material with a metal inner disc. The Mosler Model 302-402 MRK (Figure 11) is the newest combination lock Mosler manufactures. The "K" in the model designation signifies that this lock is a key change variety. When the MRK was first introduced, the dial and dial ring remained the same as the 302-402 MR hand change lock. Because these dial rings did not have a separate changing index, the operator had to use the opening index as the changing index to change combinations. This was accomplished by adding 10 numbers to the selected combination. The 302-402 MRK now has both a changing index and opening index inscribed on the brushed chrome dial ring.

- a. To Unlock.

(1) Rotate the dial a minimum of four times to the LEFT. This clears all previously dialed numbers. Stop EXACTLY at the opening index mark the fourth time the first number of the combination has reached the opening index mark.

(2) Rotate the dial to the RIGHT. Stop EXACTLY at the opening index mark the third time the second number of the combination has reached the opening index.

(3) Rotate the dial to the LEFT. Stop EXACTLY at the opening index mark the second time the third number of the combination has reached the opening index mark.

(4) Rotate dial to the RIGHT, pausing a moment at zero, and then continue rotating to the RIGHT until the dial stops. The locking bolt is now retracted. This enables the handle of the drawer or door to be "thrown", thus allowing it to be opened. Always rotate the dial slowly and evenly. Spinning the dial is unnecessary, and may cause loosening of component parts which could cause a lockout.

b. To Change Combination MOSLER MRK 302 Series (Key Change).

(1) Open drawer or door and release bolts to locked position. (If unit is equipped with a locking bolt interlock, it will be necessary to depress the interlock plunger before bolts can be thrown.) Dial the old combination exactly as you would normally in the opening instructions; however, stopping at the changing index mark, which is (approximately 10 digits) left of the opening index mark

(2) Insert proper change key (Figure 23, Section 4) in back of the lock. Be sure the change key is inserted all the way up to the shoulder on the key. Turn key to the limit of its travel in the direction indicated by the arrow marked on the lock cover.

(3) Select the new combination within the parameters given below, and write it down.

(a) Keep numbers above 13,

(b) Below 90, and

(c) Ten digits apart.

(d) Use high-low-high or low-high-low.

(4) Dial the new combination on the changing index mark as you would on the opening index mark (using proper turns), being certain of precision when stopping at the index. When uncertain of the correctness of the dialing, start over again. This will save time in case of error. After dialing the last number of the combination, do not disturb the dial.

(5) Turn the change key to the limit of its travel in the direction opposite to arrow. REMOVE CHANGE KEY.

(6) Try the new combination on the lock using the opening index at least twice before closing the container to be sure the combination is set properly and operates smoothly.

c. If New Combination Fails to Operate. If the lock cannot be opened on the new combination, it can be assumed the new numbers were not set properly. It will then be necessary to remove the cover from the lock case. Proceed as follows:

(1) Remove two screws and remove back cover plate. This will expose the wheels on the back plate. (Figure 11)

(2) Rotate dial until the fence disengages from the gate of the drive cam.

(3) Turn wheels so all change key holes line up. Keeping holes in line, turn wheels until change key holes in wheels align with change key hole in lock cover.

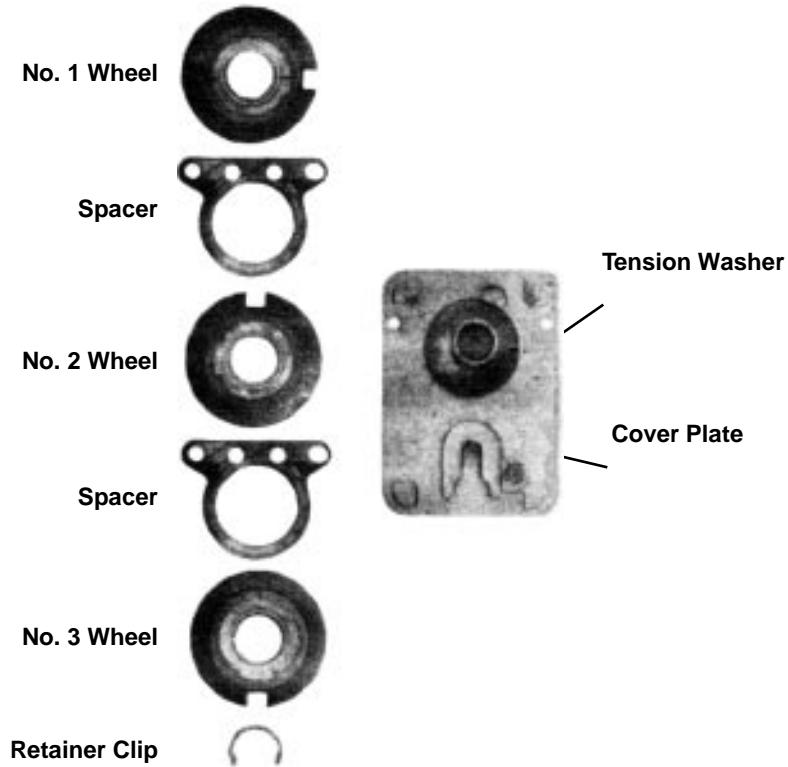
(4) Carefully replace the cover to the lock case so as not to disturb the wheels. Before attaching cover to the lock case, check to see that the change key holes in the wheels are aligned with the change key hole in the cover.

(5) Insert change key (see Figure 23, Section 4 for proper change key) and proceed as directed in the applicable paragraphs under 1-5.b with the heading "TO CHANGE COMBINATION MRK 302 SERIES".

d. To Change Combination, Mosler MR 302-402 Series (Hand Change). When selecting numbers for the new combination, use recommended method as listed in 302 MRK Key Change (paragraph 1-5.b(3)(a) through (d)).

(1) Open container as previously described in paragraph 1-5.a. Locking bolt must be extended to the locked position to remove cover. Turn dial several revolutions, stopping at approximately the number "50".

FIGURE 12: DISASSEMBLED HAND CHANGE WHEEL PACK



(2) Remove cover plate screws from rear of lock, and detach cover plate from the case. (On some containers, it may be necessary to remove a panel or small circular cover from the inside of the door to expose the lock.)

(3) Remove retainer clip from wheel post (Figure 12). Remove wheels and spacers. Wheels are numbered on outer plastic ring in order that they be replaced on post in the proper sequence. Number one (1) wheel is set at the first number of the combination, and is the first wheel on the post (Figure 12).

(4) Hold number one (1) wheel assembly with numbers up and push the center disc upward until it is removed from the outer ring. Rotate center disc until the setting mark on the metal insert is opposite the desired number on the ring. Press the center disc back into position until it's flush with the outer plastic ring. Observe that numbers increase counterclockwise on wheels. Change the combination numbers on the remaining wheels in the same manner. Remember to keep numbers above 13 and below 88.

(5) Replace parts on post in proper sequence. To help identify wheels for proper reassembly, each Mosler wheel has a number 1, 2 or 3 molded next to one side of the gate (cutout). Further confirmation is gained by observing that the gate (cutout) of the middle wheel is 180 degrees opposite zero. There may be more than one tension washer at the base of the wheel post. Numbered side of wheels are to face up. When retainer clip is replaced, check to ensure that the retainer clip is properly seated in the groove on the post (Figure 12), and that all wheels and spacers are properly mounted on the wheel post.

(6) Replace cover and screws. Tighten screws firmly.

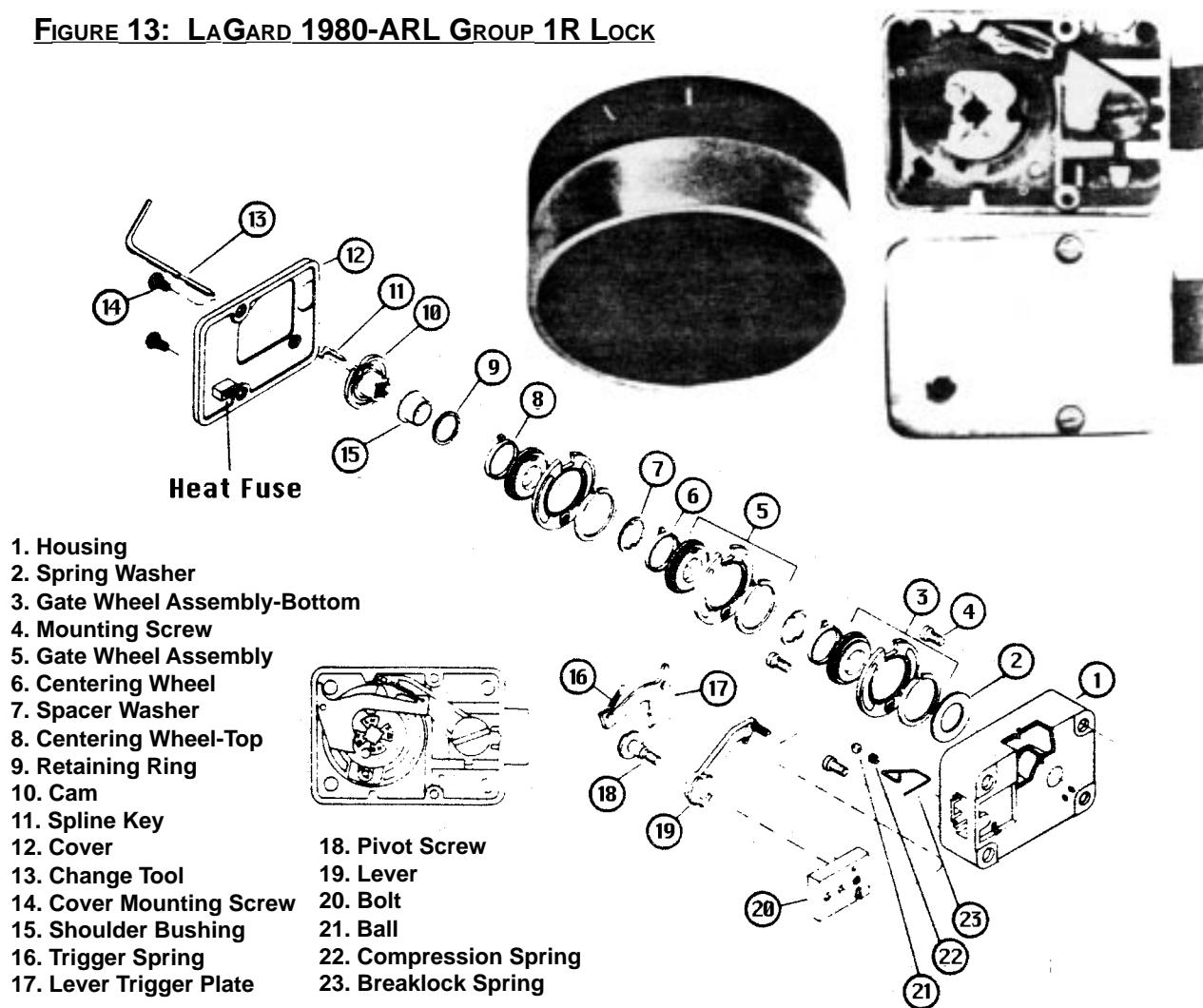
(7) Try lock at least twice on new combination with CONTAINER OPEN to be sure lock is set properly and operates smoothly.

1-6. LAGARD 1980-ARL GROUP 1R COMBINATION LOCK. The LaGard Model 1980-ARL has been certified by Underwriter's Laboratories and approved by the General Services Administration as a Group 1R Combination Lock. This lock may be found installed as original equipment on Art Metal GSA Approved Security Containers and is only available in a key change configuration. Combination changing procedures for the Group 1R LaGard are identical to that of the Mosler Key Change Model 302 MRK. Therefore, when combination changing is desired refer to the procedures listed for the Mosler 302 MRK. Change key identification is located at Figure 23, Section 4. As depicted in Figure 13, the LaGard Group 1R is easily identifiable by its unique dial and dial ring. You must use the LaGard change key as shown in Figure 23.

1-7. MAS-HAMILTON X-07 GROUP 1R ELECTROMECHANICAL LOCK (Figure 14).

a. Opening the X-07. Your X-07 lock has been shipped preset in the Single Combination Mode with the combination set to 50-25-50. Practice opening the lock several times before you set a new combination. Your X-07 uses sophisticated computer security and makes dialing much easier than that of traditional combination locks. The X-07's computer recognizes a number as being part of a combination when you stop dialing on that number and then reverse dialing directions. This enters the number into the computer memory. If at any time the dial remains stationary for more than 40 seconds, computer will reset (LCD will go blank) requiring operator to redial entire combination.

FIGURE 13: LAGARD 1980-ARL GROUP 1R LOCK



IMPORTANT: The X-07 has protective software that detects robotic dialing. If robotic dialing is detected, the X-07 will not open even if the correct combination has been dialed. User should dial with complete full wrist turns. Stopping to regroup produces the necessary pauses in dialing activity. This helps the X-07 distinguish between human and robotic dialers. The X-07 may mistake a human for a robot if the user:

- Dials more than 1.3 revolutions in either direction with no pauses in dialing activity;
- Dials with very short, quick repetitive turns, producing very short pauses in dialing activity;
- Dials combination in less than 15 seconds (10 seconds in newer version).

b. OPENING THE X-07 USING THE PRESET COMBINATION:

- (1) Dial left (counterclockwise) 4-6 turns to “power up” the lock. Numbers will appear on the LCD display screen.

FIGURE 14: MAS-HAMILTON GROUP X-07 ELECTROMECHANICAL LOCK



(2) Continue dialing left to the first number in the combination (50). Stop; the number 50 will be displayed on the screen.

(3) Now dial in the opposite direction (right, clockwise) to (25). Stop.

(4) Now dial left (50). Stop.

(5) Now dial right. After "OP" (Open right) appears on the display screen, continue dialing slowly to the right to pull the lock bolt.

NOTE: If you pass your target number by 4 or more numbers, continue to dial, but if you pass the target number by no more than 3 numbers, you may reverse direction slowly and the display will "jump back" 4 numbers. Now you may dial slowly in the original direction to the target number.

NOTE: If at any time you see a Lighting Bolt, you have made an error in dialing the combination. At this time you must allow the X-07 to "go to sleep" and redial.

c. SETTING OPERATING MODE/CHANGING COMBINATION. Before you can set a new combination, you must select and set a mode of operation.

(1) The X-07 has three modes of operation:

(a) SINGLE COMBINATION MODE: The X-07 will open when one three-number combination is successfully dialed.

(b) DUAL COMBINATION MODE: Two separate combinations are required to open the X-07. Either combination may be dialed first; however, operator must begin entering second combination within 40 seconds of entering the first combination.

(c) SUPERVISORY/SUBORDINATE MODE or SUPER/SUB MODE: Two separate combinations are required to open the lock, with the Supervisory Combination controlling access of the Subordinate Combination. The Supervisory Combination must be entered first. There can be unlimited delay between entering the Supervisory Combination and entering the Subordinate Combination. There can also be unlimited openings by the holder(s) of the Subordinate Combination until the Supervisory Combination is redialed.

(2) Retract the bolt by entering the correct current combination(s). In Dual Combination or Supervisory/Subordinate modes, you must enter both combinations.

(3) Insert the Change Key (Figure 23, Section 4) into the slot on the back of the lock.

(4) Dial to the left (counterclockwise). The Change Key Symbol will appear in the display. The lock is designed not to open when the Change Key symbol is displayed. (Technique when the drawer is locked with the key inserted.)

(5) Enter the current combination or combinations again.

(6) Dialing right, the symbol “SL” (for Select Mode) will be displayed. Now dial left to select mode of operation:

1—for Single Combination Mode

2—for Dual Combination Mode

3—for Supervisory/Subordinate Mode

(7) Stop on number of your selection. Now dial right to set the mode. The symbol “EC” (Enter Combination) or “E1” (Enter First of Two Combinations) will be displayed depending upon the mode selected.

(8) If Single Combination Mode (Selection 1):

(a) The symbol EC will be displayed. Enter the desired combination by dialing the numbers in correct sequence. LEFT (counterclockwise) to the first number. Stop. RIGHT (clockwise) to second number. Stop. LEFT (counterclockwise) to third number. Stop. RIGHT (clockwise) until display flashes new combination.

(b) The display will flash the new combination three times and then display the

symbol PO (for Pull Out Change Key). Remove the Change Key. This will cause the Change Key symbol to disappear. The display will show the symbol CC (Confirm Combination(s)).

(c) To confirm the combinations, redial the new combinations. When the OP (Open right) appears on the display, continue dialing to the right to retract the bolt. The combination is now set.

(9) If Dual Combination Mode (Selection 2) or Super/Sub Mode (Selection 3): (NOTE: For Dual mode, either combination may be entered first; for Super/Sub mode, the Super combination must be entered first.)

(a) The "E1" symbol will be displayed. Enter the first new combination. Dial: Left to the first number. Stop. Right to the second number. Stop. Left to the third number. Stop. Right until display flashes new combination. The display will flash the new combination three times then show the symbol "E2" (Enter second combination).

(b) Dial the second new combination in correct sequence, in the same manner as the first combination was entered. The display will flash the new combination three times, then display the symbol "PO" (Pull Out Change Key).

(c) Remove the Change Key. This will cause the Change Key symbol to disappear. The display will show the symbol "CC" (Confirm Combination(s)).

(10) To confirm the combinations, redial the new combinations:

(a) In Dual Combination Mode: dial either of the new combinations. The symbol "E2" (Enter second combination) will be displayed. Enter the remaining combination.

(b) In Super/Sub Mode: dial Supervisory combination first. The "E2" (Enter second combination) will be displayed. Dial in Subordinate combination.

(c) When "OP" (Open right) appears, continue dialing right to retract bolt. The new combinations have now been set.

d. ALTERNATE METHOD OF CHANGING THE COMBINATION: This alternate method replaces steps 1 - 4. If you have lost or forgotten the current combination and have access to the back of the lock, you can select a mode of operation to set new combination(s) using the serial number found on the inside cover of the lock. This serial number will not open the lock, it will only allow you to set a new combination.

(1) Dial an incorrect combination to obtain the Lighting Bolt error symbol.

(2) Insert the Change Key into the back of the lock.

(3) Enter the serial number as the current combination. Dial:

(a) Left to first 2 digits of the serial number. Stop.

(b) Right to second 2 digits of the serial number. Stop.

(c) Left to third 2 digits of the serial number. Stop.

(d) Right to “SL” (select mode will be displayed continue with Step 5 from above).

e. LOCKOUT PREVENTION: If the door of your container is shut and the X-07 accidentally locked with the Change Key still inserted in the Change Key slot:

(1) Allow the lock to power down. (After 40 seconds the display will go blank; wait an additional minute for full power down.)

(2) Turn the dial to the RIGHT until power up occurs (numbers appear).

(3) Dial the current combination in correct sequence.

f. USING THE AUDIT FEATURES OF YOUR X-07: Your X-07 keeps count of the number of successful openings. It will also alert you if there have been 3 or more unsuccessful attempts to open the lock.

g. TO CHECK THE NUMBER OF SUCCESSFUL OPENINGS: Dial RIGHT when the lock is powered down (screen blank and no dialing for 2 minutes). After the lock is powered up, it will alternately flash two pairs of numbers. The number with the arrow flashing left represents the first two numbers of the successful opening count. The number with the arrow flashing right represents the last two numbers in the opening count. The successful openings count does not reset. The number will reflect the total number of times the X-07 has been opened since it was manufactured. When the X-07 has been opened 9,999 times, the count will begin again at 0 and continue to increment.

h. TO CHECK UNSUCCESSFUL ATTEMPTS COUNT: Dial LEFT when lock is powered down (screen blank); or Dial left after checking successful openings count. The count will be represented by a two digit number with a Lighting Bolt symbol. When the count is displayed, stop. After you have seen the count continue dialing left to enter combination. The unsuccessful attempts count will be displayed only when 3 or more incorrect combinations have been entered. The count resets to 0 whenever the correct combination is entered. If the number of attempts exceeds 99, the count will remain at 99 until reset.

PAGE INTENTIONALLY LEFT BLANK

SECTION 2: **COMBINATION LOCKS**

**SARGENT & GREENLEAF SERIES 6600
COMBINATION LOCK**

LAGARD MODEL 1800 RL COMBINATION LOCK

DIEBOLD 180 SERIES COMBINATION LOCK

YALE OC5 SERIES COMBINATION LOCK

BODE-PANZER COMBINATION LOCK

PAGE INTENTIONALLY LEFT BLANK

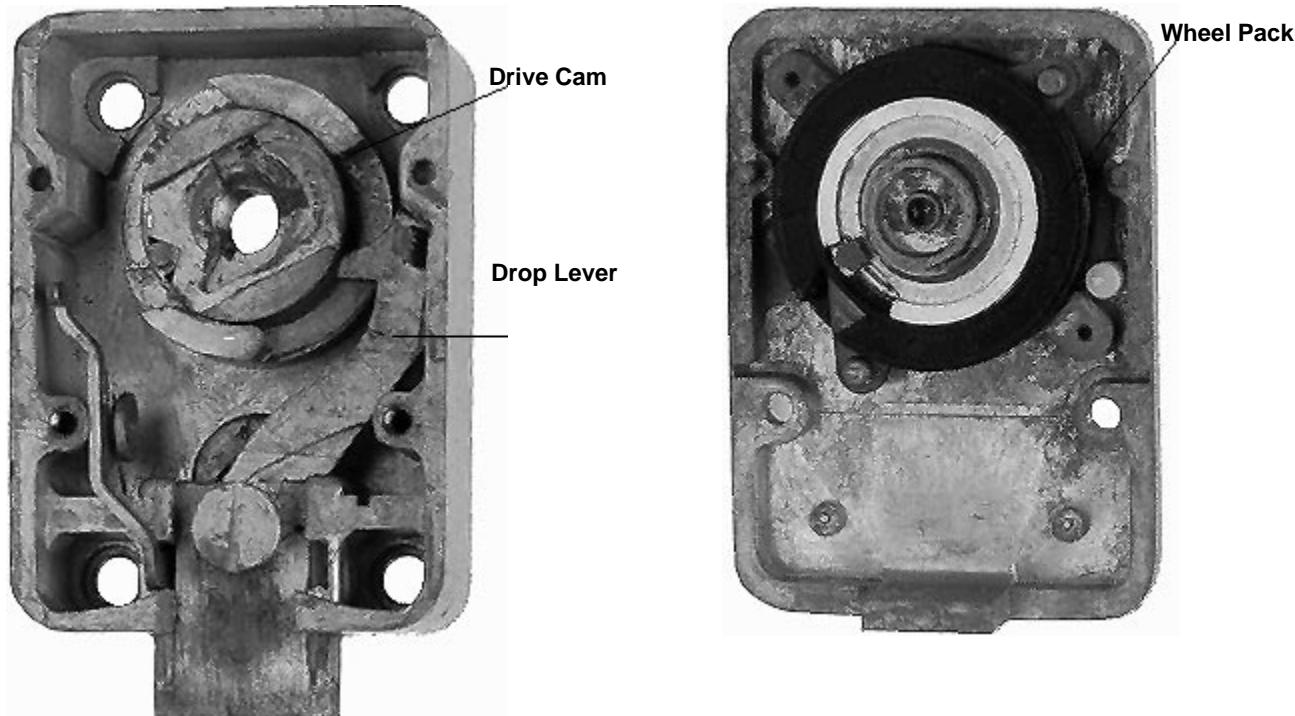
2-1. OTHER COMBINATION LOCKS.

a. As mentioned earlier in the preface to this handbook, this section contains information on other combination locks that meet the last resort criteria of AR 380-5, paragraph 5-102, which may be found on safes, chests, and other types of cabinets throughout DOD, i.e., Diebold 180 Series, Yale OC5, and Sargent and Greenleaf 6600 Series.

b. Background. In order to understand the next two combination locks, a little background history is provided.

(1) In the 1980 to 1981 time frame, Sargent & Greenleaf manufactured a 6600 series key change combination lock originally certified by Underwriter's Laboratories (UL) as Group 1. This 6600 series differed from the earlier 6600 hand change series of the 1950's and 1960's, which were true Group 1 and 1R locks utilizing the classic S&G anti-manipulation feature which consisted of a split drive cam controlled by the center arrow knob (butterfly), which allows the nose of the drop lever to engage only when the arrow knob is actuated. More detailed information regarding the early hand change 6600 series locks is included in Section 1. This 1980's version using the 6600 series designation, is a key change type utilizing a drop lever that has a roller bearing installed in the nose. This roller bearing was eccentric in shape to give erratic readings when manipulation was attempted. In April 1982, the S&G Model 6600 Series Combination Locks were tested against Military Specification (MILSPEC) MIL-L-1556E for manipulation resistance. Both the S&G Model 6600 Series Key Change Group 1 and Group 1R failed the 20 man-hour resistance to manipulation. The Defense Industrial Supply Center, Philadelphia, Pennsylvania, was notified and arrangements were made between S&G and the US Government to replace those 6600 series combination locks that failed the MILSPEC, with either the S&G 8400 or 8500 series combination locks. Because of the various styles of dials and dial rings on S&G products, the only positive way of determining the S&G Model 6600 Series Combination

FIGURE 16: SARGENT & GREENLEAF 6600 SERIES HAND CHANGE LOCK



Lock of the 1980's is to remove the lock's back cover plate and inspect the drop lever. Figure 16 shows the interior of the S&G 6600 Key Change Combination Lock. Changing combinations on the 6600 Series lock is the same as that of any other S&G key change lock. IF ANY OF THESE COMBINATION LOCKS ARE INSTALLED ON GENERAL SERVICES ADMINISTRATION (GSA) APPROVED SECURITY CONTAINERS, THEY SHOULD BE REPLACED.

(2) Another combination lock, manufactured by LaGard Corporation of Torrance, California, was introduced into the system. This combination lock (Model 1800 RL), was originally certified by UL as Group 1R. In December 1982, this lock was also tested against the MILSPEC for manipulation resistance. This lock failed the required manipulation resistance of 20 man-hours.

c. Remarks. Although both the S&G Model 6600 Series Combination Locks and the referenced LaGard Group 1R Combination Lock have been certified as either Group 1 or Group 1R by UL, these locks are referred to in this handbook as Other Combination Locks because of their proven susceptibility to manipulation. NEITHER THE S&G 6600 SERIES COMBINATION LOCKS OF THE 1980'S NOR THE LAGARD COMBINATION LOCKS, ARE TO BE USED AS REPLACEMENT LOCKS ON GSA APPROVED SECURITY CONTAINERS.

2-2. DIEBOLD 180 SERIES (Figure 17). These Key Change Combination Locks may still be found on old containers and safes, but are no longer manufactured. THEY DO NOT MEET GROUP 1 OR GROUP 1R REQUIREMENTS.

a. To Unlock.

(1) Rotate the dial a minimum of four times to the LEFT. Stop EXACTLY at the opening index mark the fourth time the first number of the combination has reached the opening index mark.

(2) Rotate the dial to the RIGHT. Stop EXACTLY at the index mark the third time the second number of the combination has reached the opening index mark.

(3) Rotate the dial to the LEFT. Stop EXACTLY at the opening index mark the second time the third number of the combination has reached the index mark.

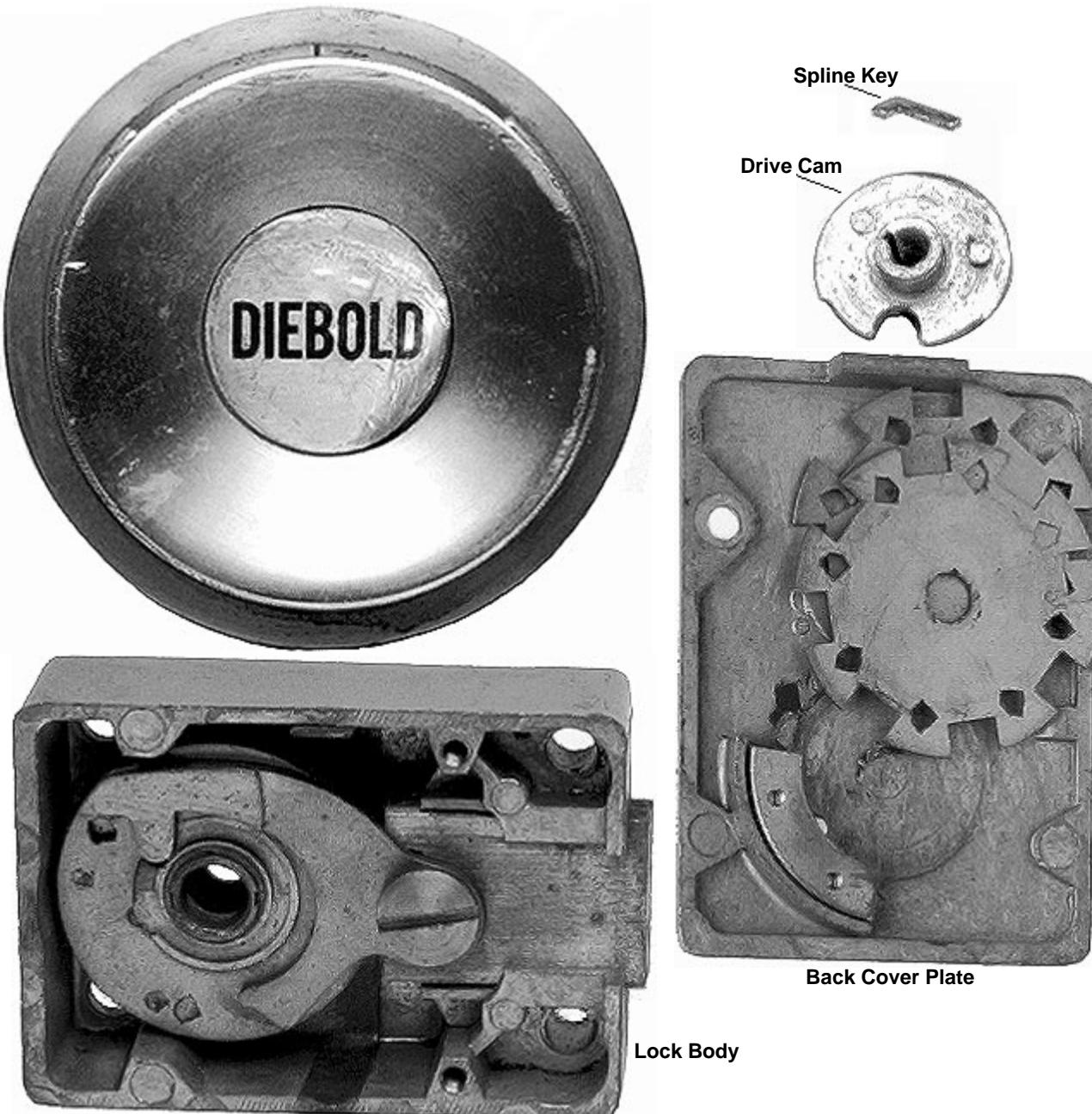
(4) Rotate the dial to the RIGHT, pausing a moment at zero, and then continue turning to the RIGHT until the dial stops. The locking bolt is now retracted. This enables the handle of the drawer or door to be "thrown", allowing it to be opened. NOTE: Always turn the dial slowly and evenly. Spinning the dial is unnecessary and may cause loosening of component parts that could cause a lockout.

b. Changing Instructions. This lock is considered a "0" (zero) change lock; therefore, no changing index is provided.

(1) Operate the lock on the old combination, stopping when the last number comes to the opening index at the top of the dial ring.

(2) Insert the change key through the hole in the back of the lock case. The key must be inserted until the end comes to a stop on the bottom of the case. Turn key to LEFT (counterclockwise), as you face the inside of the door, through approximately half a revolution to stop.

(3) Select three numbers on which to set lock.

FIGURE 17: DIEBOLD 180 SERIES KEY CHANGE LOCK

- (a) Keep numbers above 10,
- (b) Below 90, and,
- (c) A minimum of 10 digits apart.
- (d) Use high, low, high or low, high, low; i.e., 32-19-71 or 19-71-32.

(4) Rotate the dial LEFT (counterclockwise), stopping when the first number aligns with the opening index the fourth time around.

(5) Rotate the dial RIGHT (clockwise), stopping when the second number aligns with the opening index the third time around.

(6) Rotate the dial LEFT (counterclockwise), stopping when the third number aligns with the opening index the second time around.

(7) Rotate the change key to the RIGHT (clockwise), as you face the inside of the door, approximately half a revolution to stop, and withdraw the change key.

IMPORTANT: The lock is now set on the new combination. Operate the new combination several times before you close the door to be sure that it works correctly and that you know the combination. If the lock fails to operate, a mistake has been made.

c. Procedures If Combination Fails.

(1) Remove the cover of the lock.

(2) Arrange the three combination wheels so the key hole in the wheels is in line with the key hole in the cover. This is easily done by inserting the key through the wheels and into a hole in bottom of the case. Be sure not to turn the key while the cover is removed.

(3) Withdraw the key, and replace the cover.

(4) Insert the key and follow changing instructions paragraph 2-2.b from the beginning.

2-3. YALE OC5 SERIES. These Hand Change Combination Locks may still be found on old cabinets, but are no longer manufactured. They do not meet Group 1 or 1R requirements.

a. To Unlock.

(1) Turn the dial a minimum of four times to the right stopping exactly at the opening index mark (Figure 18) the fourth time the first number of the combination has reached the opening index mark.

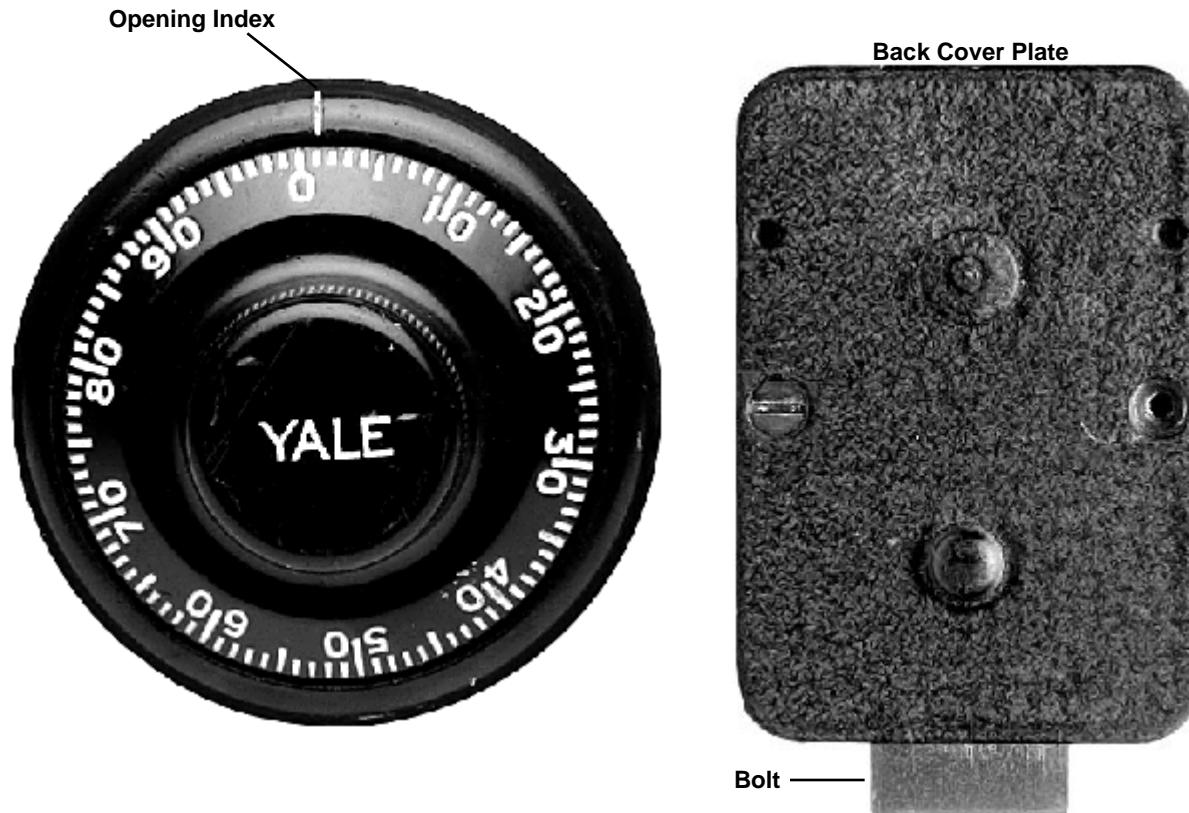
(2) Turn the dial to the left, stop exactly at the opening index mark the third time the second number of the combination has reached the opening index mark.

(3) Turn the dial to the right, stop exactly at the opening index mark the second time the third number of the combination has reached the opening index mark.

(4) Rotate the dial to the left, pausing a moment at zero, and then continue turning to the left until the dial stops. The locking bolt is now retracted. This enables the locking link age to be retracted by the handle, thus allowing opening of the door or drawer. **NOTE:** Always turn the dial slowly and evenly. Spinning the dial is unnecessary, and may cause loosening of component parts, which could cause a lockout.

b. To Change Combination.

(1) Open drawer or door and release bolts to locked position. This will prevent inadvertent lockouts due to drawer being closed without attached wheel pack and released relock. (If unit is equipped with a locking bolt interlock, it will be necessary to depress the interlock plunger before the bolts can be thrown.)

FIGURE 18: YALE OC5 SERIES LOCK

(2) Remove cover (Figure 18) from lock by removing two screws attaching cover to case (on some safes, it may be necessary to remove a panel or small circular cover from the inside of the door or drawer to expose lock).

(3) Remove retaining clip from wheel post. (If difficulty is encountered in the identification of component parts, refer to Figure 12, Disassembled Hand Change Wheel Pack in the Mosler Instructions.)

(4) Remove wheels and spacers and align in proper order for reinstallation. (These wheels are generally not numbered as to sequence.) The last wheel removed from the post is number 1 wheel and the first number of the new combination, etc.

(5) Hold number one (1) wheel assembly with numbers up and push the center disc upward until it is removed from the outer ring. Rotate the center disc until the setting mark is opposite the desired number on the ring. Carefully press the center disc back into position until it is flush with the outer ring. Change the combination number on the remaining wheels in the same manner.

NOTE: When selecting numbers for the new combination, use recommended methods as listed below:

- (a) Keep numbers above 10;
- (b) Below 90, and
- (c) Ten digits apart;

- (d) Use high-low-high or low-high-low;
- (e) Whenever possible do not use numbers ending in 5 or 0.

(6) Replace parts on posts in proper sequence. Numbered side of wheels are to face up. When the retaining clip is replaced, make sure that it is properly seated in the groove on the post.

(7) Turn the dial off zero, and then replace the cover and screws. Tighten screws firmly to preclude vibration causing loosening and allowing the relock to trigger.

(8) Try lock at least twice on new combination with door or drawer open to be sure the lock is set properly and operates smoothly.

2-4. BODE-PANZER COMBINATION DIAL LOCK.

a. The Bode-Panzer Combination Lock, which is manufactured in Hanover, West Germany, is also included in this section, because of the quantities found in use throughout Europe.

b. To Unlock:

- (1) Rotate the dial to the RIGHT, and stop when the first number of the combination reaches the opening index for the fourth time.
- (2) Rotate the dial to the LEFT, and stop when the second number of the combination reaches the opening index for the third time.
- (3) Rotate the dial to the RIGHT, and stop when the third number of the combination reaches the opening index for the second time.
- (4) Rotate the dial slowly to the LEFT to stop.

NOTE: This is just the opposite of US-made locks.

IMPORTANT: When dialing you may stop and resume turning the dial as often as you like without changing the direction of the turn. If you overshoot your mark by rotating the dial beyond the number required, the unlocking procedure must be started over again otherwise the mechanism will not work. Such dialing mistakes do not affect the lock in any way.

c. General Instructions. Each lock delivered by the factory is set to a combination of three numbers which are divulged to the buyer in a special registered letter. The lock must be reset immediately after its receipt, to a new three number combination to preclude compromise. Before you start changing the combination, write down the three numbers which you intend to use for the new combination on your lock. In the interest of security, recommended that you select three numbers as far apart from one another as possible (with intervals of at least 10 digits), distributing them as evenly as possible over the dial. Do not use numbers ending with a 0 or a 5, exclusively.

d. To Lock. Rotate the dial to the RIGHT at least five times.

e. Changing the Combination. Change the combination as follows (do not forget to jot down the new numbers before the change). The Bode-Panzer Combination Lock is considered a "0" (zero) change

lock; therefore, a separate changing index is not provided. The single index mark suffices for both opening and combination changing procedures.

(1) Proceed exactly as described in the Unlocking instructions (paragraphs 2-4b), without making the last turn to the LEFT, mentioned in paragraph 2-4b(4) above.

(2) Insert the combination change key as deeply as possible into the change key hole provided in the back of the lock.

(3) Turn the change key 90 degrees to the RIGHT, and leave it in that position.

(4) Rotate the dial at least five times to the RIGHT, and stop when the first number of the new combination reaches the index mark.

(5) Rotate the dial to the LEFT, until the first number has passed the index twice, and stop when the second number reaches the index.

(6) Rotate the dial to the RIGHT, until the second number has passed the index once, and stop when the third number reaches the index.

(7) Rotate the change key 90 degrees to the LEFT, until it can be extracted. Extract the change key.

(8) Rotate the dial to the LEFT, until it comes to a stop. The lock is again open.

CAUTION: After the first change of a combination or any subsequent change, the new combination must be tried several times before it is used to lock a cabinet, to check whether the new combination functions properly.

PAGE INTENTIONALLY LEFT BLANK

SECTION 3: **COMBINATION PADLOCKS**

**SARGENT & GREENLEAF
MODELS 8065, 8077, 8077A, 8077AB,
8077AC, AND 8088**

PAGE INTENTIONALLY LEFT BLANK

3-1. SARGENT & GREENLEAF (S&G) PADLOCKS OVERVIEW. There are six versions of the S&G, three position, dial type, changeable combination padlocks found in the field. These are the S&G Models 8088, 8077, 8077A, 8077AB, 8077AC, and the 8065. They are considered reusable seals only, and by specification are not protected against forced entry. These padlocks should be restricted to indoor or sheltered areas; they are not designed for exterior use. Additionally, these padlocks cannot be used in securing materiel classified SECRET and above, as stated in AR 380-5, paragraph 5-102. When used for storage of materiel classified CONFIDENTIAL, the shackle and back cover plate numbers should be recorded and inventoried at least annually.

a. The S&G Model 8088 is the oldest version of these padlocks and can be identified by the lack of a chrome colored metal shell enclosing the padlock body. This model lacks protective measures (shielding) and should be replaced by the 8077A model.

b. The S&G Model 8077 is the updated version of the 8088 in several ways. This is the first padlock meeting Federal Specification FF-P-11O. The body of the 8077 is enclosed in a chrome colored metal shell protecting the body of the padlock, and adds protection to the change key hole located in the back of the pad lock. The removable back cover plate of this padlock is made of the same material (stamped sheet metal) as the rest of the padlock shell. Internal changes to the mechanism have been added for more security.

c. The S&G Model 8077A (Figure 19) is the updated version of the Model 8077 and will be the most common S&G padlock found in the field. The modification of this padlock consists of the back cover plate being constructed of a heavier (die cast) material than that of the chrome colored metal case

FIGURE 19: SARGENT & GREENLEAF MODEL 8077A PADLOCK



enclosing the padlock body. Additional changes have been incorporated in the internal mechanism to provide additional security. In 1981, S&G began producing the 8077A with a "webbed" back cover plate. This "webbed" back cover plate should be replaced with the smooth back that was originally designed for the 8077A. Approximately 35,000 webbed back cover plates were manufactured, and there is a strong possibility that you will encounter the S&G Model 8077A with webbed back cover plates in your area of operation.

d. The S&G Model 8065 is a concealed shackle combination lock with a body approximately the size of the S&G 8077 padlock. The 8065 lock comes with a special shoe or mounting plate for attachment to a cabinet. It was anticipated that more than one mounting configuration would be encountered; therefore, it can be used in four different positions. For convenient viewing of numbers while dialing combinations, the dial shield may be rotated to any of four positions so that the opening may be placed at the top to compensate for the individual mounting orientation as shown in Figure 20. When the shield position is rotated, the entire combination including the opening or last number must be changed accordingly since both the opening and changing index marks are carried on the shield. The fourth number of the combination usually referred to as the opening number will always be zero when the lock is mounted in the number one position. Other positions follow the coding listed in paragraph 3-2.a.(4) and Figure 20. These locks are usually found on locking bar type cabinets, extreme care must be used when operating and/or changing combinations on this lock. (OBSERVE CAUTION: See NOTE at page 42.)

FIGURE 20: SARGENT & GREENLEAF MODEL 8065 PADLOCK



3-2. S&G 8065 SERIES:

a. To Unlock. Rotate the dial slowly and steadily. After turning the correct number of revolutions, should any number be turned beyond the index mark, the entire series of combination numbers must be re-dialed. DO NOT TURN BACK TO REGAIN PROPER ALIGNMENT OF THE NUMBERS. Each time a selected number is aligned with the index, a revolution is counted. Lock is set on 10-20-30 after final inspection at the factory.

(1) Operate the combination in the conventional manner, that is, at least four turns LEFT, and stop at first number on the dialing index.

(2) RIGHT three turns and stop at second number on the dialing index.

(3) LEFT two turns and stop at third number on the dialing index.

(4) RIGHT to 0 on dialing index if the lock is mounted in the number one position (vertical UP). The following coding must be used for other mounting positions:

(a) 15 on dialing index for number two position.

(b) 30 on dialing index for number three position.

(c) 45 on dialing index for number four position.

See NOTE 2 after paragraph 3-2.c(9).

(5) Depress push button and release completely.

(6) Continue turning dial RIGHT until dial stops. The bolt is now retracted.

b. To Lock. To lock rotate the dial LEFT five times.

c. To Change the Combination:

(1) Perform operations 3-2.a(1) thru (5).

(2) Depress push button half way between red lines and hold while turning dial LEFT until it stops, or until dial is free to turn.

(3) Remove lock from shoe.

(4) Perform operations 3-2.a(1) thru (4) to the CHANGING INDEX.

(5) Insert the change key and turn it to the LEFT.

(6) Proceed to set up a new combination by performing operations 3-2.a(1) thru (4), EXCEPT place each number on the changing index.

DO NOT use a number between 0 and 15 for the third combination number when the lock dial shield is correct for the number one mounting position. Also, avoid 15-30 for number two position, 30-45 for number three position, and 45-0 for number four position.

(7) Lock the wheels by turning the changing key RIGHT and remove.

(8) Try the new combination several times on the changing index. Do not turn the dial to the locked position. If the combination is correct the key hole will accept the change key.

(9) Remove key, set combination on changing index. Depress and release push button. Remembering to dial the fourth opening number 0, 15, 30, or 45 in accordance with the shield position code. Replace lock into shoe, rotate the dial to the right.

NOTE: If changing process was correct, the push button will be automatically released from its half way down position and both red lines will be seen. In this condition the lock is locked to the shoe and from now on the dialing index mark must be used for operating the lock as instructed above.

NOTE: The dial shield has spring loaded detents. The lock can be mounted in any position. The dial shield can be turned to a position that is convenient to operate, but the combination must be reset.

d. Mounting Position Compensation. The lock is normally shipped with the combination set to the type one position. To change to another position, proceed as follows:

(1) Perform operations 3-2.a(1) thru (4) and 3-2.c(2) thru (5).

(2) Rotate the dial shield to the desired position.

(3) Proceed to set up the new combination by performing operations 3-2.a(1) thru (4), except set each number on the changing index. Adhere to third number rule in paragraph 3-2.c(6) and opening or fourth number code, paragraph 3-2.a(4).

(4) Perform operations 3-2.c(7) thru (9).

CAUTION: DO NOT force concealed shackle (lock bolt) closed if misaligned with hasp staple or any object that impedes the free movement of the concealed shackle lock bolt. Such action will ruin lock and cause it to malfunction. Also, do not rotate shield to another position and expect the combination to operate unless the numbers have been reset to the new position as per instructions in paragraph 3-2.d. If it is suspected that the position of the shield has been moved when a lock does not function on the known combination, attempt at least two trials of the "known" combination dialed with the shield in each of the four positions. Remember to use the correct last or fourth number according to the position code. (Figure 20).

3-3. S&G 8077, 8077A, 8077AB AND 8077AC SERIES. (NOTE: These instructions apply to the series of combination padlocks.)

a. On the front body of the lock there are two indexes. The index located in the center is used for dialing the lock open. The index at the side is used for changing the combination. This is a precision lock. The combination numbers must be aligned exactly with the index. When dialing a combination, rotate the dial slowly and steadily. If the dial is turned past the number, do not turn back to line up the number you must begin the entire combination again. One turn is counted each time the number you are dialing is aligned with the opening index, no matter where you start.

NOTE: Effective immediately, the S&G Series 8077AC combination padlock replaces the 8077AB model. In addition to a cosmetic change, the new padlock represents an improvement in resistance to

surreptitious entry techniques. The most visible change in the 8077AC is its black dial with white numbers. In other respects, the 8077AC is identical in appearance to the most recent version of the 8077AB. The 8077AC is the only padlock that meets the requirements of Federal Specification FF-P-110-G.

b. To Unlock on a Factory Setting. All locks in this series are set on 25 after final inspection at the factory. To unlock when set on 25:

- (1) Turn four times LEFT to 25.
- (2) Turn RIGHT until 0 is aligned with the opening index.
- (3) Pull shackle out.
- (4) On a three number combination for example, 28-16-34:
 - (a) Turn four times LEFT to 28.
 - (b) Turn three times RIGHT to 16.
 - (c) Turn two times LEFT to 34.
 - (d) Turn RIGHT to 0.
 - (e) Pull shackle out.

c. To Change the Combination. Make up a new combination by selecting three new numbers. Do not use a number between 0 and 20 for the last number. For maximum security do not use numbers ending in 0 or 5, and do not use numbers in a rising or falling sequence. Write the combination down:

- (1) Open the lock as described under To Unlock. Turn shackle 90 degrees left or right to allow locking bolts to retract.
- (2) Turn the cover locking screw clockwise on the back of the lock until it comes to a complete stop.
- (3) Remove rear cover plate by sliding upward toward the shackle.
- (4) Turn the cover locking screw back counterclockwise until it comes to a complete stop.
- (5) Re-lock the shackle.
- (6) Dial the old combination, using the CHANGING INDEX. You may want to cover the opening index with tape to avoid confusion. Use the same procedure as for opening.
 - (a) Turn four times LEFT to the first number of the combination on the changing index.
 - (b) Turn three times RIGHT to the second number of the combination on the changing index.
 - (c) Turn two times LEFT to the third number of the combination on the changing index.

(d) Turn one time RIGHT to 0 on the changing index. Do not pull out the shackle.

(7) Using the elbow of the 8077/8088 change key, turn the Key Hole button on the back of the lock clockwise to the open position. If the button will not turn, you have mis-dialed the original combination. Repeat step 6, being sure to align each number with the changing index.

(8) Insert the tip of the change key into the Key Hole until the tab of the key is completely inside the lock. Turn the key one quarter turn clockwise. (9) Rotate the dial counterclockwise five complete turns; this erases the old combination.

(10) Dial the new combination to the changing index, using the same dialing procedure as before. Do not return to 0.

(11) Turn the change key one quarter turn counterclockwise and remove.

(12) Dial the new combination including zero on the changing index. Using the change key elbow, turn the Key Hole button to the closed position. If the Key Hole button will not return to the closed position, the combination has been incorrectly dialed. Redial.

(13) Remove the tape from the opening index, and open the lock with the new combination, following the "To Unlock" instructions. Pull the shackle out.

(14) Turn the cover locking screw clockwise until it comes to a complete stop.

(15) Slide the rear cover into place.

(16) Turn the cover locking screw counterclockwise until it comes to a complete stop. Re-lock the lock.

d. Remarks.

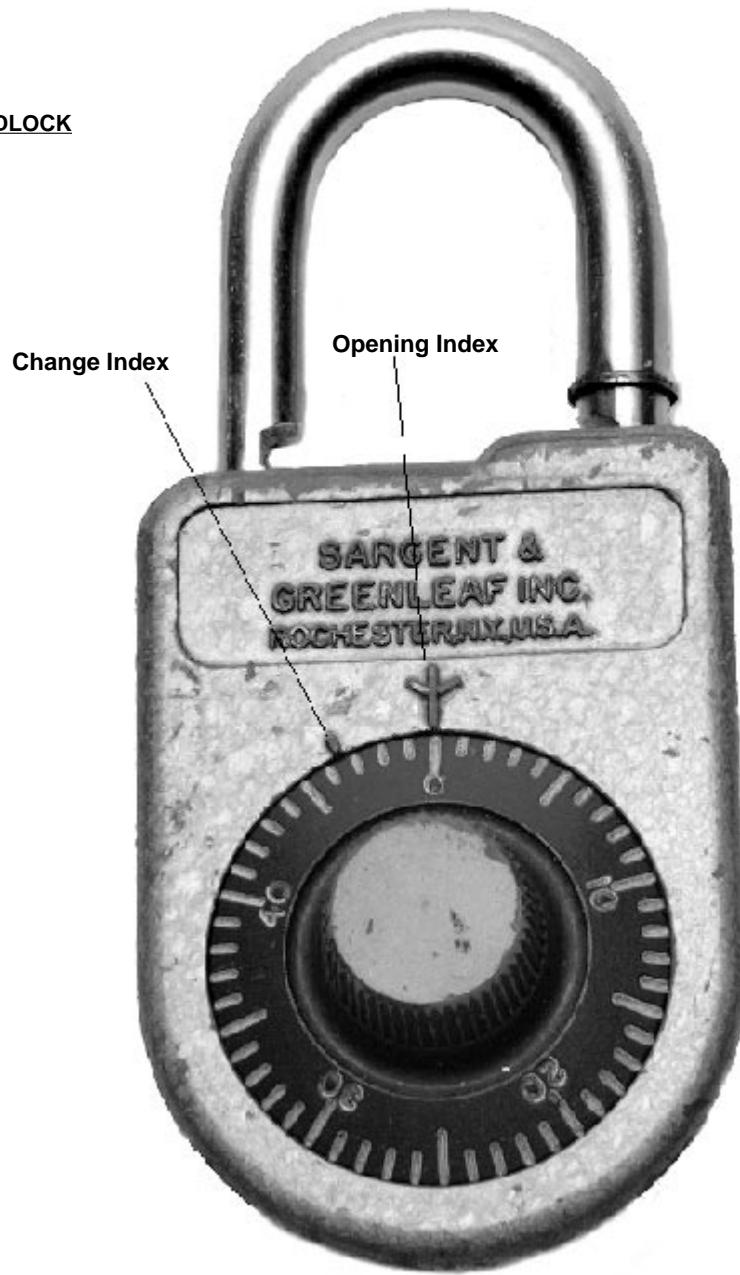
(1) The 8077 series padlock has a built-in series of checks so that an operation can not be completed if a mistake has been made. The mistake can then be corrected before it is too late. Thus, no servicing is necessary.

(2) The 8077 series padlocks are not designed for exterior use and afford no forced entry protection!

3-4. S&G 8088 SERIES.

CAUTION: BEFORE OPERATING THE LOCK OR CHANGING THE COMBINATION, READ ALL THESE INSTRUCTIONS THOROUGHLY. NOTE THAT THE 8088 COMBINATION PADLOCK IS NOT DESIGNED FOR EXTERIOR USE AND AFFORDS NO FORCED ENTRY PROTECTION.

a. Operating and Servicing. Operating and combination changing is the same for this lock as it is for the S&G 8077 Series. This is a precision lock. The combination numbers must be aligned exactly with the index. When dialing a combination, rotate the dial slowly and steadily. If the dial is turned past the number, you must begin the entire combination again. One turn is counted each time the number you are dialing is aligned with the opening index, no matter where you start (Figure 21).

FIGURE 21: S&G MODEL 8088 PADLOCK

b. To Unlock. Early models of the 8077 and 8088 were factory set on 10-20-30. More recent models are factory set on 25. To unlock when set on a three number combination. For example, 28-16-34:

- (1) Turn four times LEFT to 28.
- (2) Turn three times RIGHT to 16.
- (3) Turn two times LEFT to 34.
- (4) Turn RIGHT to 0.
- (5) Pull shackle out.

c. To Lock. Push the shackle in and rotate the dial to the LEFT five complete turns.

d. To Change the Combination. Make up a combination by selecting three new numbers. Do not use a number between 0 and 20 for the last number. For maximum security do not use numbers ending in 0 or 5, and do not use numbers in a rising or falling sequence. For example, 25-35-50 is not as good a combination as 38-24-42. **WRITE THE COMBINATION DOWN.**

- (1) Open the lock as described under To Unlock.
- (2) Slide the change key hole cover up and hold it while you close the shackle.
- (3) Dial the old combination, using the opening procedure, but aligning the numbers on the CHANGING INDEX. You may want to cover the opening index with tape to avoid confusion. NOTE: If one or more numbers are set to the opening index instead of the changing index, and the change key hole cover is closed, the lock is useless.
 - (a) Turn four times LEFT to the first number of the combination on the changing index.
 - (b) Turn three times RIGHT to the second number of the combination on the changing index.
 - (c) Turn two times LEFT to the third number of the combination on the changing index.
 - (d) Turn RIGHT until 0 is aligned with the changing index.
- (4) Insert the 8077 or 8088 change key in the key hole and turn it clockwise one quarter turn (Figures 24 and 25).
- (5) Dial the new combination to the changing index, using the same procedure as before.
- (6) Turn the change key back counterclockwise one quarter turn, and remove the change key from the lock.

(7) **DO NOT CLOSE THE CHANGE KEY HOLE COVER.** Using the opening index, dial the new combination and open the lock. CAUTION: Try the new combination at least three times before closing the change key hole cover.

e. Servicing Instructions for 8088 Combination Padlock. When the key hole is open and the padlock does not unlock, use the following procedures to recover the combination. NOTE: The reset key is used for aligning the wheels so that the combination may be set with the regular change key. To reset the combination:

- (1) Look into the open key hole of the lock and rotate the dial slowly until the square hole in the visible wheel is in line with the key hole.
- (2) Insert the reset key in the key hole of the lock until ring groove A, on the reset key, is flush with the lock cover (Figure 22).
- (3) Turn key clockwise, one quarter turn.

(4) While pressing the key in lightly, turn the dial in same direction as before, slowly until key enters the lock up to ring groove B (Figure 22).

NOTE: Dial should not be turned or jarred while performing steps 5 and 6.

(5) Pull the reset key out to ring groove A.

(6) Turn the key counterclockwise, one quarter turn.

(7) Push the key into the lock until ring groove B is level with the cover.

(8) Turn the key clockwise one quarter turn.

(9) While pressing the key in lightly, slowly turn the dial in the same direction as before until key enters the lock beyond groove B, until it stops.

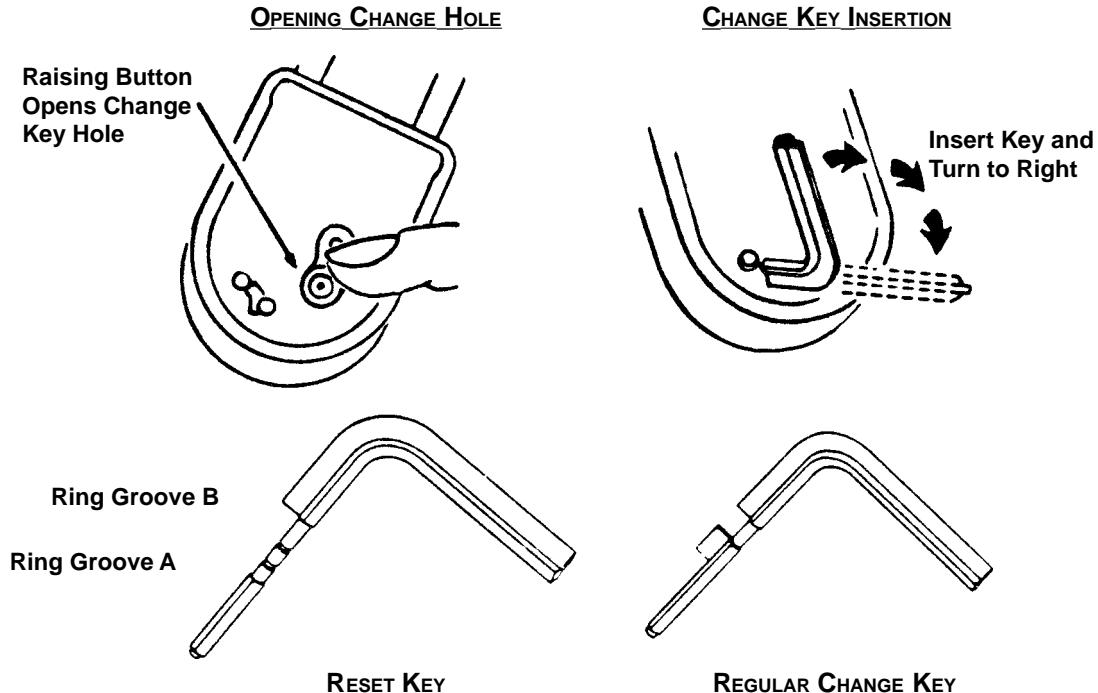
NOTE: Dial should not be turned or jarred while performing steps 10 and 11.

(10) Pull the reset key out to ring groove B.

(11) Turn the key counterclockwise, one quarter turn.

(12) Remove the reset key, insert the regular change key and proceed to set the combination as outlined in the instructions in paragraph 3-4d(4) thru (7) entitled "To Change the Combination".

FIGURE 22: RESET KEY AND REGULAR CHANGE KEY



PAGE INTENTIONALLY LEFT BLANK

SECTION 4: **CHANGE KEYS**

PAGE INTENTIONALLY LEFT BLANK

4-1. CHANGE KEYS. Figure 23 shows all the change keys presently available for combination locks and padlocks covered by this Technical Data Handbook. These change keys are shown in actual size and configuration, and may be used as a template to determine the proper change key. The manufacturers of Mosler and Sargent & Greenleaf locks have informed this office that their keys are available through sources listed below. However, Bode-Panzer no longer manufactures the change key necessary for their lock.

a. Sargent & Greenleaf Source:

Sargent & Greenleaf, Inc.
Corporate Headquarters
1 Security Drive
Nicholasville, Kentucky 40356
Telephone: (606) 885-9411
Fax: (606) 887-2057

b. Mosler Source:

Mosler Government Sales
1401 Wilson Boulevard
Arlington, Virginia 22209
Telephone: (703) 525-5800

FIGURE 23: CHANGE KEYS



SECTION 5:
SECURITY MANAGER
INFORMATION

DRILL RESISTANT HARD PLATE

CLEAR PLASTIC DIAL COVERS

**SARGENT & GREENLEAF MODEL 8470
MODIFICATION**

PAGE INTENTIONALLY LEFT BLANK

5-1 PURPOSE. This new section provides the Security Manager or responsible individual with information regarding ancillary equipment normally associated with combination locks.

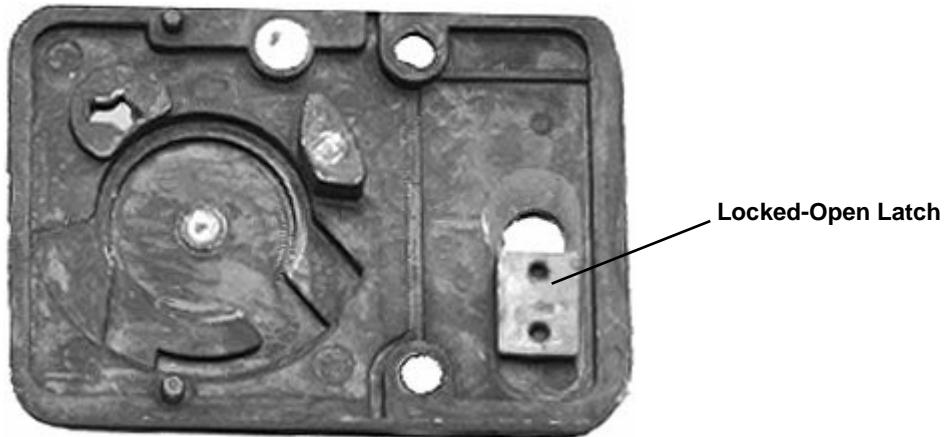
5-2 DRILL RESISTANT HARD PLATE. A 1/8 inch drill-resistant hard plate should be installed between the S&G Model 8470 and the locally fabricated door. In certain regulations and manuals, this hard plate is a requirement that should not be overlooked. The drill-resistant hard plate should be installed at the same time the 8470 is installed. Remember, drill-resistant hard plate is not a template for the 8470 Combination Lock.

5-3 CLEAR PLASTIC DIAL COVERS. Certain regulations and manuals require clear plastic dial covers be placed on all combination locks. Plastic dial covers are generally supplied with each new container for the appropriate lock installation.

5-4 S&G MODEL 8470 MODIFICATION. S&G now manufacturers a new "Locked-Open Latch" which is used on their Model 8470 (Figure 24). The back cover plate can be retrofitted on existing 8470's. The latch is designed so that passersby cannot spin the dial of the combination lock when the combination has been dialed, or use back-dialing to recover the combination.

FIGURE 24: S&G MODEL 8470 MODIFICATION

Back Cover Plate (Inside View)



PAGE INTENTIONALLY LEFT BLANK

SECTION 6: **PEDESTRIAN DOOR LOCKS**

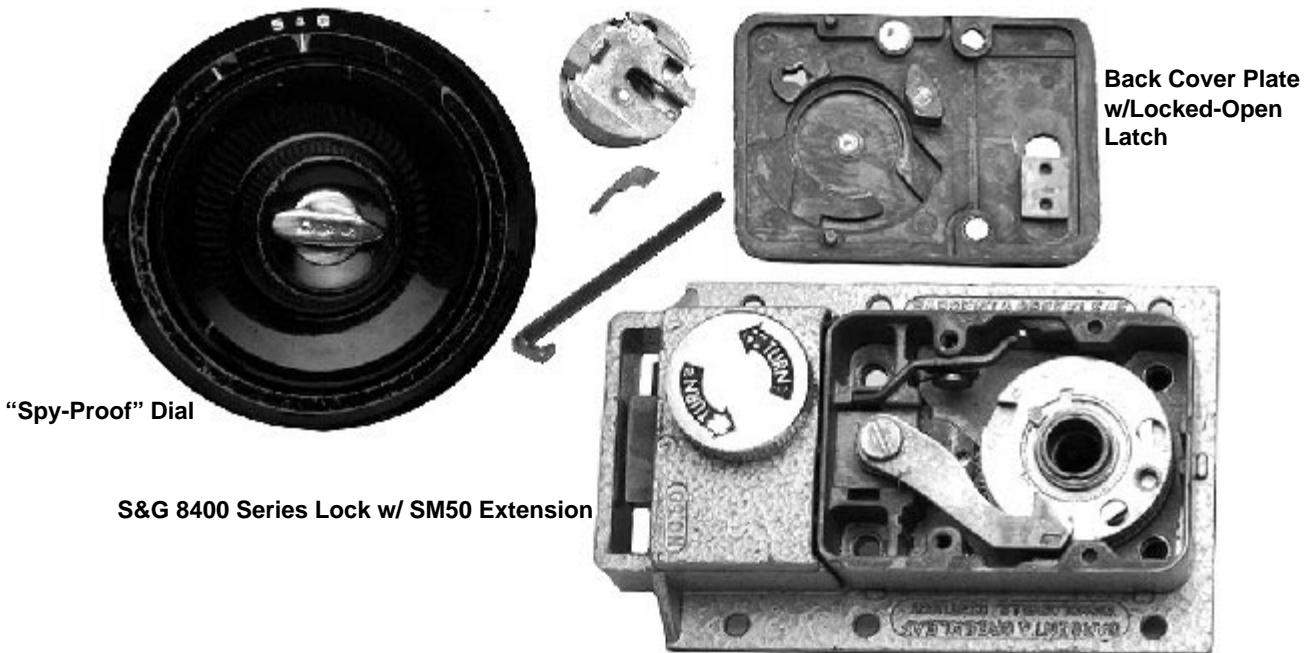
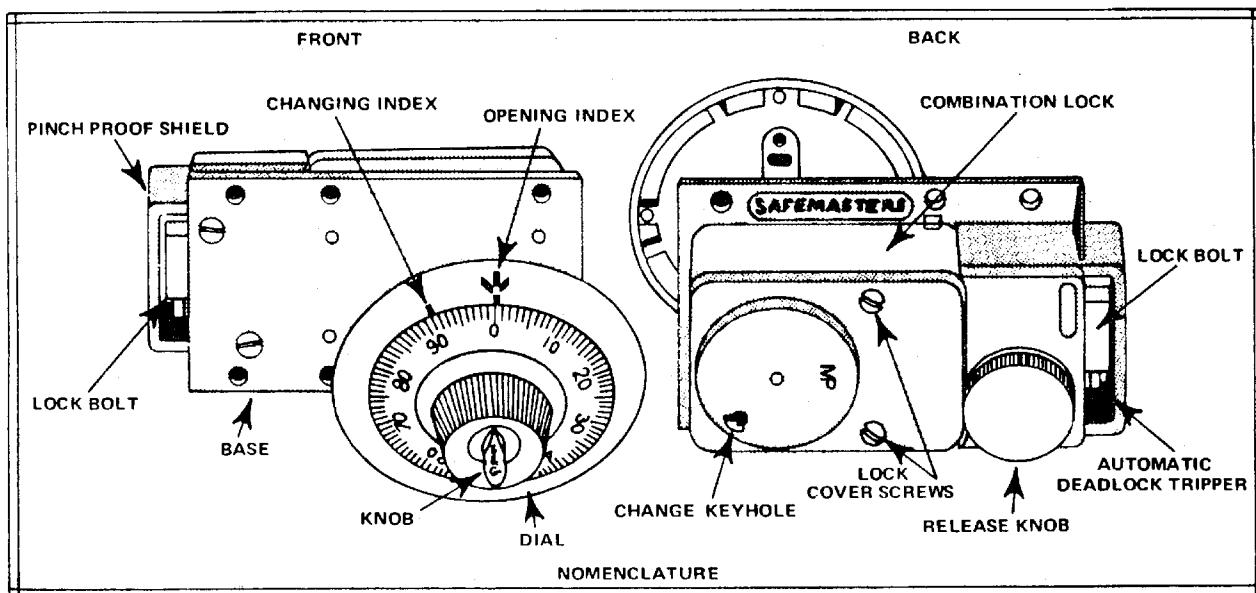
**SARGENT & GREENLEAF MODEL 8470
COMBINATION LOCK WITH DEADBOLT (SM50)**

CDX-07 MAS-HAMILTON PEDESTRIAN DOOR LOCK

PAGE INTENTIONALLY LEFT BLANK

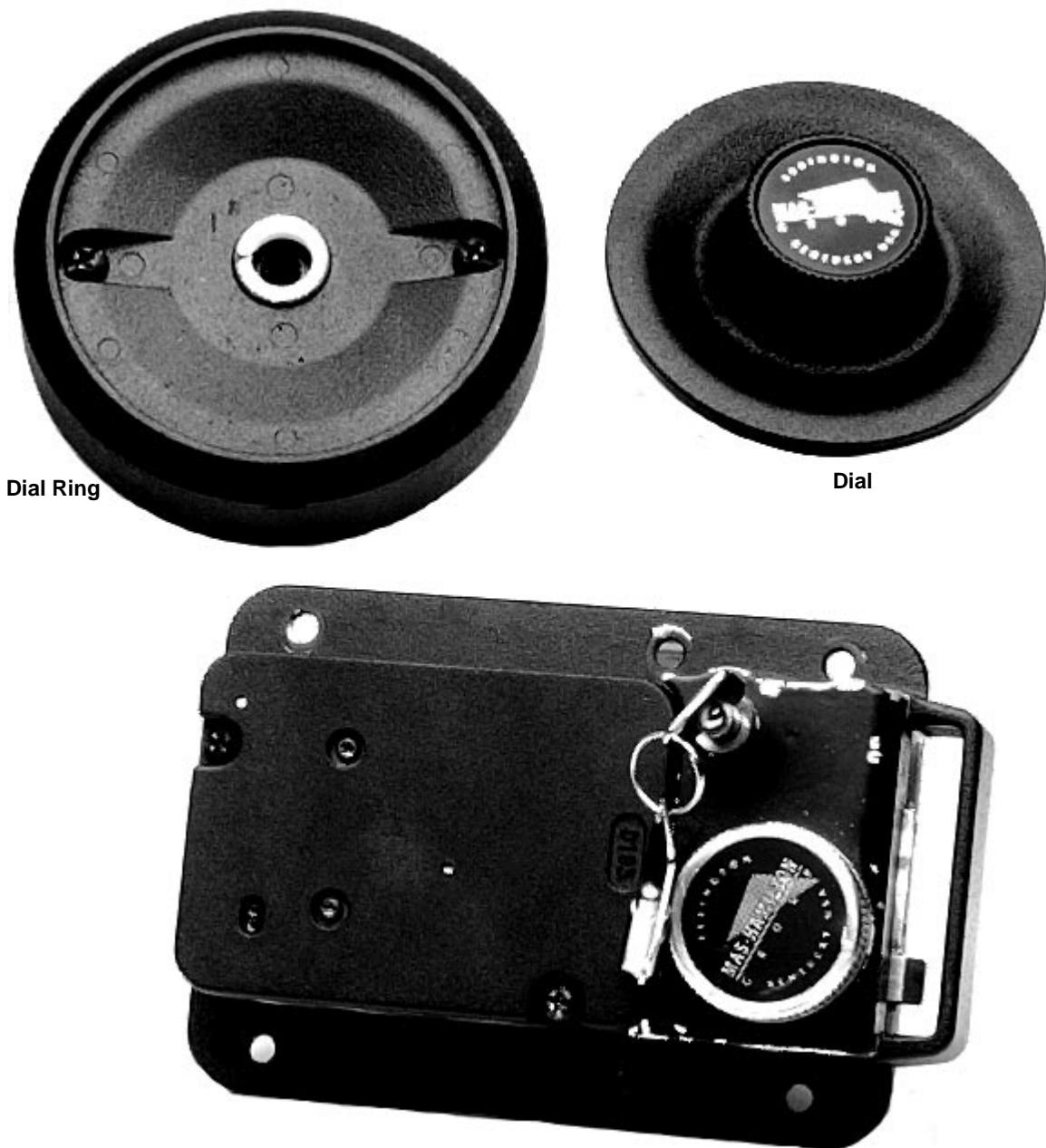
6-1 SARGENT & GREENLEAF MODEL 8470 COMBINATION LOCK WITH DEADBOLT. Figure 25 shows what is termed a S&G Model 8470, formerly SM50 Pinch-Proof Combination Lock. It is a reversible, surface-mounted lock for use on locally fabricated doors constructed of either wood or metal. The lock features an automatic deadlock tripper, and an inside release knob allowing the lock to be opened from the inside in the event the door is closed and the combination is spun off. The 8470 can be ordered with either the S&G Model 8400 or 8500 Series Combination Lock; Spy-Proof Dial (TOP READING) should be specified. In the event the 8500 Series Combination Lock has been specified, ensure the proper handing of the lock (i.e., left or right) is also specified. Handing of the 8500 Series combination lock is described in Section 1, paragraph 1-3. In addition, ensure that the lock is equipped with a tube for ease of installation.

FIGURE 25: S&G MODEL 8470 COMBINATION LOCK WITH DEADBOLT



6-2 MAS-HAMILTON CDX-07 PEDESTRIAN DOOR LOCK. Figure 26 shows the CDX-07. In keeping with more stringent occupational safety regulations, the Mas-Hamilton CDX-07 has a key-operated life safety system with the addition of a standard bolt holdback knob. The push button allows the bolt to stay retracted. To release the bolt, simply turn the button with the key. Drill guides offer exact mounting hole locations. The CDX-07 matches the bolt patterns and footprint of the existing SM50.

FIGURE 26: MAS-HAMILTON CDX-07 PEDESTRIAN DOOR LOCK



Back Cover Plate with 50 Extension (Lockmaster 5100)